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EDUCATIONAL PSYCHOLOGY

A Problem Approach



by

ROBERT S. ELLIS

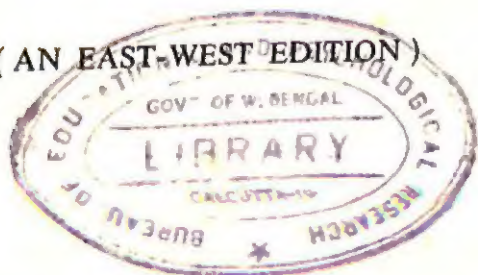
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EDITOR'S FOREWORD

With numerous textbooks on educational psychology in existence, it is necessary that a new one in that field shall justify itself by having something unique to offer. The novel feature of Professor Ellis's contribution is its educational-problem-centered approach.

American educational philosophy, largely grounded in the James-Dewey-Kilpatrick tradition, has taught that we learn best by mastering problems. Formal education should duplicate the nature and the human nature of everyday life by offering the learner opportunities to face realistic problems and to solve them. While this principle has made considerable difference in education below the college level, with some exceptions its implications have not generally been carried out at the college level.

Textbooks and courses in educational psychology have often been almost indistinguishable from those in general or introductory psychology. If there have been significant differences they have resulted largely from selective goals, some topics having been omitted from the educational-psychology courses and textbooks because of their relative unimportance for that field.

The "atmosphere" of the usual textbook in educational psychology can be summarized in two questions, in order: (1) What are the psychological facts and principles? (2) What are their implications for education? The problem-centered approach that has been emphasized by Professor Ellis turns things almost completely around. It can be summarized in two related but different questions, in reverse order: (1) What are the problems met in education? (2) What has psychology to offer in contribution to the solutions of these problems?

In terms of the psychological content selected, the problem approach makes less difference than one might expect. The chief differences should be evident in terms of the modes of learning and of the attitudes of the learners of educational psychology. To the extent that they accept the problems as their own, and to the extent that the problems seem urgent, the psychological material should become vital-

ized and hence better remembered and remembered in functional ways. Perhaps more important would be the development of generalized habits of recognizing professional problems, of defining them, of seeking appropriate sources of information for their solution, and of recognizing where solutions are inadequate and new investigations are needed. This should contribute to an alert, growing professional individual.

J. P. GUILFORD

PREFACE

This volume is intended for use as a textbook in an introductory course in educational psychology. It is designed to give either college students or teachers in service an understanding of the more important applications of psychological facts and principles to educational problems.

It is recommended that the course in educational psychology be preceded by at least a semester course in general psychology, and, if circumstances permit, it is desirable that students have a course in child psychology before undertaking the study of educational psychology. However, the facts and principles applied have been explained before being applied, and, for that reason, it might be possible to get satisfactory results with a class that had not had previous training in psychology.

It would appear that more significant results should be obtained in the study of educational psychology if we start with actual educational problems, such as the content and organization of the curriculum, teaching methods, guidance, and discipline, and show how, through the application of psychological facts and principles, educational procedures can be made more effective.

This method of attack has been tried out by the author in a number of classes, both in undergraduate and in graduate work in educational psychology, with results more satisfactory than those following from the use of more conventional methods of approach. Under the circumstances, therefore, it seemed worth while to organize a new text along these lines. It is presented with the hope that it will enable beginning students who have had some foundation in the study of general psychology to get a better grasp of the relationships between psychology and education.

In a book of this character it is quite impossible to give proper credit to all of the workers who have contributed to the development of the various principles and their applications. There is also a reasonable question as to how far it is desirable in an introductory text to attempt to support all statements made by references to the

literature. There is at least a danger that such references may tend to distract and confuse the beginning student rather than to help him. I have tried to follow a middle path in that respect. However, my ideas have, in large measure, been borrowed from others, and that is freely admitted here. I do wish, though, to express my thanks to those writers and publishers from whom I have borrowed quotations, tables, and charts.

ROBERT S. ELLIS

Claremont, California
January 1951

CONTENTS

CHAPTER	PAGE
PREFACE	v
EDITOR'S FOREWORD	xi
I. INTRODUCTION	1
The Field and Function of Educational Psychology	3
An Outline of Educational Problems for Psychological Study	10
Some Difficulties in the Applications of Psychology to Education	16
II. THE ADMISSION AND CLASSIFICATION OF PUPILS, THEIR ACHIEVEMENT, AND THEIR ELIMINATION FROM SCHOOL	23
Group Differences	35
Classification	49
III. THE CURRICULUM	61
Psychological Principles	64
Some Applications	83
Other Problems	95
IV. EXTRACURRICULAR ACTIVITIES	99
Psychological Principles	106
Applications	108
Forms of Extracurricular Activity	110
V. GENERAL PRINCIPLES OF TEACHING	126
An Evaluation of These Methods	128
Herbart's Five Formal Steps	129
The Methods of Progressive Education	131
How Determine Teaching Methods?	133
Some General Principles of Teaching	134
Types of Learning Situations	155

CHAPTER	PAGE
VI. OBSERVATION AND THE DEVELOPMENT OF CONCEPTS	160
Reading	170
Teaching Foreign Languages	176
Teaching Procedures	178
VII. TEACHING FOR EFFECTIVE MEMORIZING	184
Rote Memory Learning	203
Problems and Methods	204
Other Subjects	216
VIII. THE TEACHING OF REASONING	219
Some Principles of Teaching Reasoning	227
IX. TEACHING MOTOR ACTIVITIES	247
Variations in Capacity for Motor Learning ...	251
Characteristics of Motor Learning	262
Some Problems in Motor Learning	268
Some Principles of Learning Motor Activities ..	271
A General Formula for Teaching Motor Activities	274
Motor Learning in Special Fields	276
X. THE DEVELOPMENT OF ATTITUDES	286
Factors Influencing the Development of Attitudes	289
XI. STANDARDIZED TESTS AND THE SCHOOL TESTING PROGRAM	312
Test Characteristics	312
Intelligence Tests	319
Achievement Tests	328
Personality Tests	333
The School Testing Program	335
XII. CLASSROOM TESTS AND MARKS	339
Problems of Test Construction	344
Types of Tests and Examinations	347

CHAPTER	PAGE
Essay Tests and Examinations	348
Objective Tests	350
Psychological and Statistical Foundations of Marks	361
Marking Systems	363
XIII. EFFICIENCY IN STUDYING	373
A Study Guide for Students	376
XIV. MENTAL HYGIENE IN EDUCATION	398
Factors in Mental Hygiene	400
Further Practical Applications	418
XV. EXCEPTIONAL CHILDREN	424
Some Types of Defects	426
XVI. COUNSELING AND GUIDANCE	450
Some General Considerations	452
XVII. PSYCHOLOGICAL PRINCIPLES APPLIED TO DIS- CIPLINE	483
The Nature of Behavior and Behavior Ad- justments	493
Factors in Discipline	498
The Treatment of Behavior Problems	501
Some General Principles	505
XVIII. THE TEACHING STAFF	509
Difficulties of the Teaching Profession	522
Applications	530
INDEX OF NAMES	537
INDEX OF SUBJECT MATTER	543

CHAPTER 1

INTRODUCTION

The Bases of Education.—Education is a very ancient undertaking. Even lower animals may give a certain amount of training to their young. And certainly man, for a very long period of time, has been making conscious attempts to train both children and adults. In recent years, and especially in the more civilized countries, education has become relatively much more important than formerly, and attendance at school has become compulsory.

This general emphasis on training is based on several facts which it is desirable to review briefly at this point, although some of them will be examined in greater detail later. In the first place, the human infant appears in the world in a distinctly helpless condition and has a very long period of immaturity or growth. This is associated with a strong tendency on the part of parents and other adults to protect, take care of, and teach the young. Without this protection, care, and instruction, the young could not survive. Mother Nature is thus responsible for making education necessary, and for making it desirable beyond the point of actual necessity.

The long period of immaturity is associated with a great increase in learning capacity, and this learning capacity very early reaches a level at which it becomes possible for the child to make changes in his behavior adjustments. In fact, learning of the conditioned response type is possible immediately after birth, and some have suggested that learning of this kind occurs even before birth. Certainly the proper training of the child begins soon after birth, and by the age of six or seven years the average child has reached a level so high that by common consent he is considered ready for formal education. But he is still not ready to learn many things and must have further growth and training before he is ready to undertake the study of algebra or logic.

This gradual development of intelligence makes it necessary to adapt instruction to the level of ability found at each age and this in itself involves a difficult technical and practical task. This problem has been complicated by the fact that children of the same age are not alike in capacity. The scientific study of individual differences has revealed the fact that there are important differences in the rate of mental growth and that different functions in the same child will grow at different rates. Hence Johnny, aged ten, may be able to solve problems in arithmetic that his sister, aged twelve, is not able to solve even though the sister is, in general, more intelligent than Johnny and is two grades further advanced in school. These variations in capacity render the problem of teaching even more difficult than it would otherwise be.

Biologists have told us that evolution has come about through a process of variation and natural selection. This suggests that successful survival is not automatic. Survival depends on successful adjustment. Under primitive conditions survival depended more than now on such things as resistance to disease, physical strength and agility, and ability to endure various kinds of physical privation such as hunger. In our present competitive industrial civilization the requirements for successful survival have become distinctly more of an intellectual sort and hence more dependent on education. Now the man or woman who would be anything more than an unskilled laborer needs more than a good digestive system and good muscles: he needs knowledge and technical skills; and the complex social adjustments and responsibilities required may place more emphasis on personality and character—which are more distinctly the products of training. Hence education is more important now than formerly as a basis of successful adult adjustment and of social and economic "survival."

This, then, roughly is the background and basis of education: man is for a long time physically and mentally incapable of taking care of himself and of doing a man's work in the world, but at the same time he has great capacity for learning to make better adjustments, and the practical necessities of adulthood require that he

spend a considerable part of this growth period in preparing himself for a more effective adjustment.

The need for education is so obvious that further argument on that point is not needed. Just how does educational psychology fit into the picture?

THE FIELD AND FUNCTION OF EDUCATIONAL PSYCHOLOGY

In the first place, it is clear that the need for education grows out of certain conditions which will not be changed greatly by any application of psychology. Human adults who are to fit into our society must have learned certain things. In that sense the aims and objectives of education are determined by certain conditions outside the field of psychology. The psychologist is not asked to give an opinion as to whether children should be taught the three R's. That is taken for granted. Any psychologist who tried to convince the public that these same three R's should not be taught would not be likely to receive much consideration, although some small boys might support the idea, especially during the fishing season. In the same way the content of the curriculum is, in general, determined largely by nonpsychological considerations. Would-be physicians must study chemistry and biology, and would-be engineers must study mathematics and physics, willy nilly, or else change their choice of vocations. And physicians and engineers are obviously necessary for the continued health and efficiency of contemporary society. Consequently, the question as to *what* the educational system is to attempt to do will be determined mainly by the demands of modern civilized society.

In this sense the psychologist is more of a technical expert just as the engineer is a technical expert. The engineer does not usually decide that bridges are to be built or even for the most part where they are to be built. There are bridges across the Mississippi River at or near St. Louis, Memphis, and New Orleans. The reason for these bridges is obvious. For the most part the engineer enters the picture after the need for the bridge is felt and quite possibly after the decision is made to build the bridge, although the final

decision may depend on the difficulties of construction and on costs. In some places a ferry would be used because the cost of a bridge would be too great. For this reason, the technical expert may assist in determining what is to be undertaken by pointing out the difficulties to be overcome and by estimating the costs in time and money. But, chiefly, the engineer supplies the knowledge and skill necessary to do a job most efficiently after the decision has been reached that it is to be done.

Similarly in the field of education, the psychologist does not determine what is to be done: his function is rather to point out the methods to be used in order to attain the desired result with the greatest degree of efficiency.

When we attempt to go beyond this general statement as to the function of educational psychology we find ourselves confronted with the fact that the authors of textbooks on the subject quite evidently have different ideas as to what should be included. This can be shown most effectively by a few quotations.

Cuff comments as follows,⁸ (p. 689) :

Casual comparisons and careful analyses of textbooks show there is but little agreement as to content and organization of introductory courses in educational psychology. The major elements included may be poached from courses in general psychology, tests and measurements, mental hygiene, adolescence, or in methods of teaching. For a course in educational psychology, a basal text prepared for almost any department may be used. But comparative studies of textbooks on educational psychology also show that they are likely to have a low degree of community of content. One study, for example, shows that Starch and Gates agree on less than thirty-three per cent of the material they embody.

In a comparison of British and American textbooks on educational psychology, Archer makes the same point,¹ (p. 128) :

It is somewhat remarkable that we never know, when we open a new text-book of educational psychology, what subject-matter it is likely to contain, or how that matter is likely to be

arranged. This variety is entirely opposed to the uniformity which we have learned to expect in text-books in the physical sciences.

Jones, in a lighter vein, comments as follows,¹³ (p. 513):

If we are sometimes perplexed as to the field covered by educational psychology, we can look back to a time when it had very definite boundaries. A quarter century ago it was bounded on the east by Thorndike and on the west by Judd.

Jones continues by pointing out that educational psychology has shifted from being primarily concerned with the acquisition of knowledge and is now greatly interested in personality development, personal and social adjustment, and preparation for community living.

In an analysis of nineteen texts in educational psychology covering the period from 1933 to 1941, Emme¹⁰ found that child psychology, learning, special methods, and personality were generally emphasized. The more recent texts placed less emphasis on tests and statistical methods. Mental hygiene was omitted by nine texts but was emphasized by five of the later ones. The aims and objectives of teaching were generally treated very lightly, and the qualifications of teachers ranked next to last in emphasis.

Along with these doubts as to the field of educational psychology, there have been serious questions raised as to whether the teaching of educational psychology—or of other technical courses in education as well—is of any value. Barzun,² (p. 205) expresses a widely held view by saying that the content of a course in education could be given in fifteen minutes of casual conversation. Many other laymen go further and profess to believe that technical training in education is even detrimental to good teaching. And professional educators have doubted that our teaching is better today as a result of the developments in educational psychology during the past forty years.

In an experimental attack on this problem, Hult¹² finds a correlation of only .15 between the class mark in a course in educa-

tional psychology and teaching success, although the correlation between practice teaching and the course mark is .75.

From the foregoing it is evident that educational psychology has not yet reached the point where its content has been stabilized or its value universally recognized. This presents a definite challenge to those who believe that education is both a science and an art.

Many, perhaps most, educators are at least agreed that psychology does have an important contribution to make to education. The Commission on Teacher Education of the American Council on Education has felt it worth their while to prepare a book, *Helping Teachers to Understand Children*.⁷ This is a monograph on educational psychology, and most trained teachers would agree that a better understanding of children is of considerable value for those who would be better teachers.

The educational psychologists themselves, quite naturally, have had definite ideas as to the value of their subject. Davis,⁹ (p. 27 f.) comments as follows:

Psychology has made a distinct contribution to education through its analysis of pupil potentialities and differences as revealed by means of various types of psychological test. It has also contributed directly to a knowledge of pupil growth and maturation during the school years. It has contributed very little of practical value, however, in the solution of the everyday problems of the classroom teacher.

As Blair expresses it,⁸ (p. 321),

The modern teacher if he is to succeed with his work should be a specialist who understands children—how they grow, develop, learn and adjust. He should be a diagnostician who can discover special difficulties of children and at the same time possess the requisite skill for carrying forward the necessary remedial work. He should also be able to perform important educational and vocational guidance functions. No novice or person untrained in methods of psychological diagnosis can possibly fulfill the obligations and tasks which are the responsibilities of teachers.

Kelly¹⁵ has analyzed the task of educational psychology into nine different purposes which may be condensed as follows: (1)

to give a knowledge of the nature of the child; (2) to give an understanding of the nature, aims, and purposes of education; (3) to give an understanding of the scientific methods and procedures which have been used in arriving at the facts and principles of educational psychology; (4) to present the principles and techniques of learning and of teaching; (5) to give training in methods of measuring abilities and achievement in school subjects; (6) to give a knowledge of the growth and development of children; (7) to assist in the better adjustment of children and to help to prevent their maladjustment; (8) to study the educational significance and the control of the emotions; and (9) to give an understanding of the principles and techniques of character training. These objectives, most will probably agree, constitute a reasonably large order for a single course, and if the course is even fairly successful in achieving these objectives, the time and effort will have been well spent.

In a somewhat more technical spirit, Charters⁶ raises the question: "Is there a field of educational engineering?" He is disposed to answer the question in the affirmative. This means that education, like engineering, must apply scientifically determined facts and principles to the solution of practical problems. Many, but not all, of these principles will come from the field of psychology. The educational engineer will be concerned to produce specified educational results with maximum efficiency. This requires an economy of time and money, and it also requires that any objectionable by-products be reduced to a minimum.

The question posed by Charters suggests a new approach to the subject of educational psychology. Engineering is concerned with the solution of practical problems: engineers build roads, dams, and skyscrapers; they make machinery and tools; they mine coal and oil. In doing this they apply knowledge gained in such fields as mathematics, physics, chemistry, and geology. If the same kind of approach is used in education, we shall be starting with educational problems and attempting to solve them by making use of knowledge from such fields as may be related to the problem at hand.

This approach has, in fact, been suggested by several earlier writers. Worcester,¹⁸ in 1925, made a list of 77 items covering the content of a course in educational psychology given in the summer school and taken mostly by teachers in service. He had these items rated by 92 teachers as to their interest and importance for them. At the top of the list there were, in order, the following items: adjustment; material to meet individual needs; how to study; individual differences; intelligence; effect of school on the child's physical condition; heredity; brilliant children; educational and vocational guidance; individual differences in ways of learning, and in difficulties; the importance of environment as compared with heredity; the laws of learning; and malnutrition.

In a later study of teachers in service, Flesher¹¹ found the ten problems most frequently reported by the teachers themselves to be, in order of importance: discipline, evaluation, material and equipment, individual differences, assignments, teaching of classes, promotions, testing, teaching schedule, and recitations. Their administrators and supervisors gave a somewhat different list. These, in order of importance, were: discipline, teaching of classes, professional relationships, personal habits, teacher-administrator cooperation, meeting individual differences, attitude towards pupils in school, routine procedures, assignments, and treatment of parents. In both cases, discipline is considered the most serious problem, and there is agreement on several other items, but the supervisors are more concerned than the teachers with personal and community relationships.

Writing in 1948, Brownell⁴ comments that it would be difficult to prove that classroom teaching is better than it was thirty years earlier in spite of the better understanding of the psychology of learning and the fact that most teachers have had courses in educational psychology. This suggests that the teaching of educational psychology has not been effective. Brownell also suggests a remedy (p. 497):

The educational psychologist will greatly improve his chances of bettering classroom practice if he . . . re-directs his efforts. In this case he will start with the problems of instruction and will

go from there to our knowledge of the learning process, to select what is most useful.

This approach, which we may call a problem approach, and which has been suggested by various writers during the past quarter of a century, will be used in the present textbook: instead of presenting a survey of the principles that *might be applied* by teachers in service we shall make a survey that will start with the problems themselves, and we shall attempt to show how these may be solved through the application of the facts and principles of contemporary psychology.

There are several reasons for using this approach. In the first place, intending teachers, as well as teachers in service, may be expected to find a treatment of actual educational problems of more interest than a treatment of theoretical principles. An incidental but important result for intending teachers will be an increased understanding of the educational problems themselves, and this should add to the significance of the other courses in psychology and in education. In the second place, since the pioneer experiment of Thorndike and Woodworth in 1901, educational psychologists have had experimental evidence in an increasing amount that transfer of training is not automatic. We have been teaching the theory that students cannot be trusted to make applications of principles without assistance and that we must accordingly make in our courses such applications as we consider important. Yet, in educational psychology itself, we have failed rather generally to put the theory into practice. While this might be done to some extent by teaching the principles and then pointing out some of their applications, the more effective method would seem to be to use the problems as the basis of organization.

In the third place, the problem approach has been used very successfully elsewhere. In business psychology, textbooks are organized on the basis of business problems, such as advertising, efficiency, morale, and employment. There are, for example, a number of substantial books on the psychology of advertising. The student is not left to take a variety of courses and to assemble from these the assorted facts and principles that are relevant to the total problem

of effective advertising. Similarly the business student who is interested in personnel selection may turn to any one of a number of books on that subject. These will give him an integrated treatment of the subject and not expect him to assemble and integrate for himself the assorted facts and principles that are needed.

In a different area, the law schools have for a long time been using the case method. They have found that this gives the embryo lawyer a better understanding of the legal principles and of their application. This method makes the study of law more interesting and makes it much easier to remember what is taught.

In schools of medicine, much the same situation holds. After a year or two spent on the fundamentals of anatomy, physiology, biochemistry, and related subjects, the student attends clinics which study actual cases of illness; and finally, before the medical graduate begins the practice of medicine, he has a year or two of practical work as an interne.

In view of the foregoing, it seems that little is likely to be lost and much may be gained by using the problem approach in educational psychology. Those who have the time and the inclination may, of course, profitably extend their training in this area by taking such specialized courses as the psychology of learning, tests and measurements, child psychology, individual differences, the psychology of personality, and mental hygiene. Then, in addition, there are the more specialized studies of the psychology of elementary school subjects and of the psychology of secondary school subjects. These will go into these problems in much more detail than is possible or desirable in an introductory course in educational psychology.

AN OUTLINE OF EDUCATIONAL PROBLEMS FOR PSYCHOLOGICAL STUDY

In some of the quotations given previously, some of the more important educational problems have already been indicated. We shall now outline these as they will be treated in this text, and in the following chapters these topics will be treated in greater detail.

This idea, that we should begin with a generalized view of a new subject before taking up the more detailed aspects for closer study, is related to a number of psychological principles. About a century ago Herbert Spencer formulated a principle of evolution which seems to apply to the development of knowledge in the individual as well as to social evolution, individual growth, and the origin of species. Gardner Murphy ranks this as among the three or four big ideas developed during the past century.

According to Spencer's principle, development is from the general to the particular, from the vague to the definite, from the unspecialized to the highly differentiated and specialized. In saying that development is from the general to the particular, there is a danger of causing confusion in that this might be interpreted to mean that typically one learns by starting with general principles and proceeds from them to particular cases. What is actually meant is something quite different: that our first understanding or perception of things is generalized in the sense that it lacks accurate detail. On slight acquaintance we may confuse two people who, on further acquaintance, appear to us to be quite different, because with further experience we notice details about their appearance which at first escaped us.

Learning a new subject should then begin by getting a view of it as a whole and should proceed by analyzing it into parts, each to be studied in greater detail. In part this is in line with the Gestalt view that the primary emphasis is to be placed on the whole. It is in line with the integration movement because seeing the subject as a whole facilitates integration. It is also in line with the experimental evidence which shows that learning is accomplished more rapidly and efficiently if we have a clear understanding of what we are attempting. With this explanation of our method of attack, we may now proceed to the task at hand.

As a further means of getting a general view of educational problems we shall next consider some facts about our school population. Why do children generally enter school between the ages of six and seven years? Are there good psychological reasons for that practice?

In order to teach large numbers of children economically, they have been classified into grade groups. Modern tests have shown, however, that these "grades" vary greatly both in intelligence and in achievement. As a result, attempts have been made to secure more homogeneous groups through the use of tests. Does this result in better learning?

Then there are problems relating to the elimination of pupils from school. To what extent are psychological factors involved here? These and related problems will be discussed in Chapter 2.

Educational aims are, for the most part, determined by relatively nonpsychological factors. This is mainly because psychology as a science is not concerned with the determination of values. Questions as to what is worth while and what should be done are problems of practical objectives or of philosophy and religion. Consequently, it is not the business of psychology to say what should be attempted in education. What is desirable educationally for any given individual or group must be determined fundamentally on the basis of religious, political, economic, and other factors.

Although educational aims are not determined primarily by psychology, psychological facts and principles, however, do have an important bearing at times on the actual objectives of teaching. Because of psychological principles some educational aims may be rejected as impracticable, with the result that other aims are substituted. Again, psychology may indicate that certain aims are suitable for some members of a group but not for others. The next chapter will be devoted in part to a more detailed consideration of the ways in which educational aims are influenced by psychology.

The curricula of the schools in large measure will be determined by the aims of education. Mathematics will be required for those who are to become engineers; bacteriology will be necessary for prospective physicians; and English composition is essential for those who are to enter journalism. School curricula are, of course, much older than scientific psychology. At the same time, better results may be secured if curricula are planned so as to be in accord with what is known about growth, development, and learning. Also,

less effort will be wasted. Chapter 3 will consider some of the applications of psychology to curricular problems.

Extracurricular activities on the part of students have been regarded at times as an evil—as activities in which students engaged to work off energy that might better have been expended on their academic subjects. That this has frequently been true can hardly be questioned, but it would also appear to be true that, when properly conducted, extracurricular activities may be of great educational value. Human beings are complex. There are important nonintellectual functions that need training, and, as our schools are at present conducted, participation in some extracurricular activities is necessary for a well-rounded education.

This need for an extracurricular program becomes all the more evident when we consider the present emphasis on educating the whole child and on giving training in social adjustment. Ordinary classroom activities are of necessity not well adapted to the giving of some forms of social training although such training may be secured in connection with various student activities. These problems will be discussed in Chapter 4.

Actual teaching involves the use of some kind of procedures or methods. To be most effective these methods should be based on the psychology of learning. There are some general principles of learning and hence of teaching that apply to most subjects. They are important in most teaching situations. These will be discussed in Chapter 5.

Learning situations differ sufficiently so that it is possible, without being too arbitrary, to divide them into a number of types. For this reason separate chapters will be devoted to teaching methods in connection with each of the following: sense perception, including laboratory work and the development of concepts; memory of the rote variety, as in spelling, the vocabulary of foreign languages and many basic facts, and rational memory, as in learning meaningful material where causal or other relations are emphasized; reasoning and the solution of problems, as in science and other rational subjects; motor learning, especially in athletics but also in some other subjects; and the development of attitudes and ideals, especially as

related to the teaching of such subjects as social science and literature. It is not to be understood that one entire subject is to be taught by one method, or even that an entire lesson or unit must necessarily be taught by one method. A single assignment or project may involve several different kinds of learning.

If education is to be most effective it is necessary that we have accurate information about student abilities, achievements, and personality characteristics. This has been made possible to a greater degree than ever before by the development, during the past half-century, of standardized tests of various types. The use of these tests in appraising the characteristics and achievements of students will be considered in Chapter 11.

Although standardized tests are of great value, they are generally not suitable for analyzing and evaluating the progress of pupils from day to day. Tests made by the teacher and other methods of appraisal must be used.

Tests and examinations are used extensively in the schools. Marks and grades are commonly given when papers are returned to students. A student's success in a course is usually indicated, especially at the high school and college levels, by the assignment of a semester or course mark or grade. Important psychological principles are involved in such uses of tests in connection with teaching.

Studies of teachers' marks have revealed the fact that they are often very unreliable. They can be made less so by the application of scientific principles.

The extent to which some of the more important objectives of education have been attained cannot be determined accurately by ordinary methods of measurement. This has led to the development of methods for making more general evaluations or appraisals of student progress. These problems will be discussed in Chapter 12.

Not only do teachers need to know how to teach, but students need to know how to study. By learning better study techniques students may save time and effort and may at the same time do their work better. Chapter 13 is devoted to this problem.

The importance of physical hygiene is generally recognized. The importance of mental hygiene also is coming to be recognized. Instruction may be efficient in some ways, but the total effect on the student may not be good because of a bad emotional atmosphere in the classroom. Unfortunately, mental hygiene is not yet on an adequate scientific basis. Hence it is not possible to speak or to write with entire certainty as to what is necessary in order to get the best results in this field. However, in spite of shortcomings in our knowledge, it seems worth while to discuss this topic. This will be done in Chapter 14.

For financial reasons it is necessary that students be taught in groups, and, on the whole, these groups have been taught with considerable efficiency in spite of the individual differences within groups, but some pupils deviate from group norms to such an extent that they create special school problems. This is especially true of those children who are most brilliant or most retarded, of those who are behavior problems, and of those who have special physical or psychological disabilities or defects such as deafness or motor paralyzes. Much of the work with these children requires special training and is beyond the scope of the ordinary teacher; but ordinary teachers need to be trained to recognize such cases and to see that they receive the special attention needed. However, in many small schools, no specially trained teachers will be available, and it will, therefore, be necessary for the ordinary classroom teacher to make the best adjustment to the situation that she can. These problems will be considered in Chapter 15.

In modern society different individuals will inevitably choose different careers, and, to a considerable extent, education beyond the elementary school will vary according to the interests, abilities, and vocational plans of the students. Since students vary greatly in abilities and in personality characteristics, and since they cannot be expected without assistance to understand their own abilities and limitations, it is desirable that the schools give the best possible assistance in the choosing of vocations and educational programs. This is now done in most high schools and colleges through some form of guidance program. This is discussed in Chapter 16.

We have already indicated that school discipline is perhaps the most serious problem confronted by teachers in service. Discipline is necessary for effective work in groups. It is also necessary for the individual if he is to overcome obstacles. Self-made men have had to learn to discipline themselves. During the past half-century, however, educational theories and practices have changed greatly with respect to the problem of discipline. At the same time the opinions of psychologists have varied greatly, and still vary greatly, as to the effects of different methods of discipline. In Chapter 17 an attempt will be made to arrive at some practical conclusions in this field.

In the final chapter attention will be given to some of the psychological problems concerning teachers. What are the characteristics of the most successful and of the least successful teachers? How can we improve the teaching profession?

SOME DIFFICULTIES IN THE APPLICATIONS OF PSYCHOLOGY TO EDUCATION

A number of difficulties are encountered when we attempt to apply psychological facts and principles to the solution of educational problems, and it will be well to point out some of these.

The source of our greatest difficulty lies in the fact that psychology is a new science and is furthermore a very complex and difficult science. The physical sciences have been developing for several centuries, but there was very little scientific psychology before the publication of the two-volume text on psychology by William James in 1890. Most of our psychological laboratories have been established since 1900. Because, then, of our rather recent start at scientific psychological investigation, we have quite naturally not had time to make as great advances as have been made in physics and chemistry.

A further and even more serious difficulty is found in the fact that psychological phenomena are more complex and harder to study than are the phenomena of physics and chemistry. In chemistry it is possible to deal with relatively pure substances under

controlled conditions so that there is little doubt about the results of an experiment. Furthermore, chemicals can be bought by the pound and stored so that they are available for use as and when needed. The functions studied by psychology, in contrast, are not separate entities that can be studied in isolation. They cannot be purchased by the pound or by the gross and put in storage until needed: they are the functions of living individuals, whose consent, presence, and cooperation must be secured before we can conduct an experiment.

Then there is the problem of individual differences. Color vision, rote memory learning, and deductive geometrical reasoning are not the same in different people. There are age differences, sex differences, and differences in a group of individuals of the same age and sex. Because of this, it is usually necessary to study many cases before we are able to generalize. And we must be very careful about the selection of our cases or our results may not be representative of the group as a whole.

Individuals themselves vary in performance from time to time and as a result of various factors in their lives and experience. In learning experiments it is found that motivation makes a great deal of difference. Or unrecognized differences in methods of work may make important differences. In chemistry it is possible to have accurate data on such things as barometric pressure and temperature and to make corrections for the influence of these factors, but in psychology it is not possible to measure so directly and to discount the effects of differences in motivation, concentration, and other factors that might influence the result. For this reason psychological results are almost necessarily more variable and less reliable.

Because of the foregoing conditions, we do not have fixed and precise laws in psychology to which there are no exceptions. Consequently, when we make a psychological generalization, it is usually wise to understand the qualification which E. L. Thorndike has so often used, "other things being equal." And, as he has suggested, they never are.

These considerations become of great importance when we attempt to apply laboratory findings to teaching and learning in

the schoolroom. Psychological laboratories quite naturally most often use animals or college and university students as subjects. These latter subjects are a highly selected group of superior intelligence, and they are entirely or nearly mature as far as intelligence is concerned. On the average, their motivation is probably better than that of pupils in the public schools.

As a result, it should not be surprising that some conclusions, which have been arrived at in the laboratory, have not worked out in the same way when they have been tried on pupils at lower educational levels.

A further serious difficulty arises from the fact that the newness of psychology and the incompleteness and uncertainty of some of its conclusions have encouraged the development of conflicting interpretations and of conflicting psychological schools. Consequently, we have the Behaviorists, the Connectionists, the Configurationists, the Psychoanalysts, and others. And the leaders in any particular school do not all agree. Hence we do not have just one accepted Behavioristic set of theories. As an example, Watson denies the existence of human instincts. Lashley, another Behaviorist, recognized the existence of complex patterns of human behavior that are not learned,¹⁶ (p. 525).

Under these conditions the application of psychological principles to educational problems is necessarily a difficult task. Experts are certain to disagree on various points. The student should accept that fact as a necessary part of the picture.

However, underneath this disagreement among psychologists is considerable and important agreement. Thus Carr⁵ points out that practically all psychologists agree on an empirical law of effect, but that there are a dozen different interpretations of this law. They do not agree at all on just what the law means. But from a practical educational point of view it is the empirical law that is really important: it does not so much matter what happens in the nervous system as a basis for the result. If the teacher knows that interesting material is learned more readily than material that bores the student, and that success is an important source of satisfaction, these principles can be used to make teaching more effective.

This need for a practical empiricism holds for many psychological controversies. There has been an especially bitter controversy over the question as to the influence of environment and training on the IQ. This is a very interesting and important theoretical problem, but it is not nearly so important in classroom teaching. As an empirical fact we know that there is considerable error in predictions of the IQ and that this error increases as the time interval increases, so that predictions of the IQ from age 7 to age 16 are quite unreliable. Predictions from age 2 to age 25 would be so poor that a closer estimate could be made by testing the parents than could be made by testing the child.

This unreliability of the IQ is an empirical fact. The environmentalist may explain it one way, and the hereditarian may explain it in a different way, but, as a practical matter, it means that we cannot be at all sure when we determine the IQ of a six-year-old child whether his adult IQ will be about the same or perhaps significantly higher or lower. The practical implication of this fact is that we should continue to give intelligence tests from time to time, every two or three years, and that we should not consider the test IQ to be perfect and final. Rather we should consider it as just one important fact in a total picture that is subject to change. Also there are excellent reasons for giving all children the best possible training at all ages regardless of whether this increases the IQ or not. From this we may conclude that empirical facts and principles may often be applied to education with considerable confidence even when theoretical interpretations of these findings are not in agreement.

Fortunately education is not entirely at the mercy of laboratory psychology and of the conflicting interpretations of rival schools of psychologists. Experimental education is developing as an independent empirical science¹⁴; consequently, when there is a question as to which of two teaching procedures is better, it is possible and desirable to plan and carry out an experiment and to obtain measurements of the differences in results which follow from the actual use of the different methods. Because of the complexity of the conditions, such experiments are difficult to execute in a really scientific

way, but they afford us a safer basis for teaching practice than can be had by the deductive application of laboratory results. For this reason we should always, as far as practicable, test our deductions by carrying out experiments and measuring the results.

As a final point, it should be pointed out that there is a very important difference between psychologists and educators in general outlook. Psychologists, as theoretical scientists, are interested in the discovery of truth; but educators have a practical job to do. Scientists are in no particular hurry; while they are solving one problem they uncover two new ones; they have no hopes that they will ever be able to finish their task; and they are quite willing to take as long as necessary to establish a particular conclusion. In contrast, educators, as practical men, must act today and do a particular job. Each day in the fourth grade Miss Doe has the task of guiding the learning of a group of youngsters. She cannot wait for the psychological theorists to settle their controversies so that she can be guided thereby in her instructional procedures. She must do something, and it is pedagogically important that she act with decision and with the appearance of confidence if her charges are to have confidence in her and are to learn with the greatest efficiency.

In general, therefore, our task is to endeavor to come to definite and positive conclusions, if that is reasonably possible. At the same time, we should endeavor to harbor enough mental reservation so that our ideas can be changed whenever new evidence indicates the need for a change.

QUESTIONS AND EXERCISES

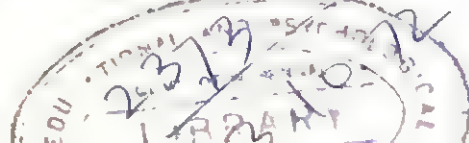
1. Why study educational psychology?
2. Explain the analogy: psychology is to education as physics is to engineering.
3. What aspects of psychology should be most applicable to educational problems?
4. What is the difference between the empirical law of effect and the theoretical laws of effect?
5. Why are empirical facts generally more important than theories in the determination of educational practice?

6. Distinguish between educational psychology and experimental education. What are the special merits of each?
7. Why is it desirable to begin a course by making a survey of what is to be covered in the course?
8. What are the special advantages of studying cases in law and in medicine?
9. What are the chief problems that concern teachers in service?
10. What shifts in emphasis have occurred in educational psychology during the past quarter of a century?
11. Under what conditions may the study of educational psychology be professionally unprofitable?
12. What may the student do to make the study of a subject more profitable and practical?
13. What may the teacher do to make the study of a subject more profitable and practical?
14. What are some of the difficulties involved in applying laboratory results to school problems?
15. From your own experience or observation, list several occurrences in the schools that are psychologically objectionable, and give reasons. How might these have been prevented?

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CHAPTER 2

THE ADMISSION AND CLASSIFICATION OF PUPILS, THEIR ACHIEVEMENT, AND THEIR ELIMINATION FROM SCHOOL

(The purpose of this volume has been stated to be the application of psychological principles to the solution of educational problems. In order to do this we need first to get a better understanding of the problems themselves. For this reason we shall begin by making a survey of the school population and their achievement.

The Education of Adults.—The education of our population 25 years of age and older in 1940 is shown in Figure 1. Separate graphs are shown for men and for women. The chart shows the percentages of each group remaining in school at each grade level. About one-tenth of the group had dropped out of school by the end of the fourth grade; about one-third had dropped out by the end of the eighth grade; and about three-fourths had quit by the end of high school. About one-tenth entered college and about half of these graduated from college.)

A further point of interest is that the women are better educated than the men, although there are more men who are college graduates. Men outnumbered women in this adult population by about one-half of one per cent, but 53.7 per cent of the high school graduates were women and 46.3 per cent were men. Of those who had not gone beyond the fourth grade, 54.8 per cent were men and 45.2 per cent were women. However, as stated above, men made up the larger part of the small minority who had finished college. Of these, about 55 per cent were men and 45 per cent women. In other words, a higher percentage of boys has been eliminated below the college level, but a higher percentage of the boys who have graduated from high school have entered college, and a smaller percentage of boys have

been eliminated from college. High school training is more often the end of formal education for girls.

Since attendance at school has been increasing, we may expect the next generation to be somewhat better educated. Also, compulsory education and other factors have operated to keep more boys in school, so that there is now less difference in the numbers of the sexes enrolled in the secondary school.

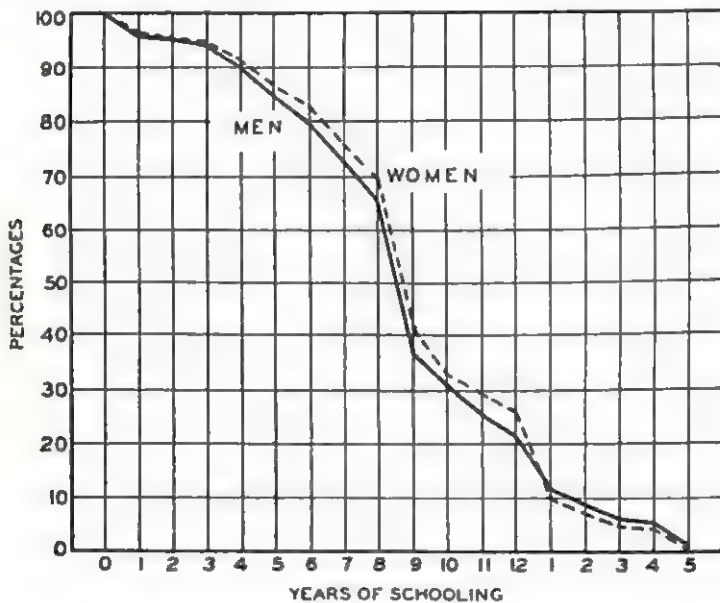


FIG. 1.—Years of schooling completed by United States adults with ages of 25 years and over in 1940 (10).

Retardation and Elimination.—We have seen how the adult population has been eliminated from school. We shall now consider the problem of elimination in a different way. The Biennial Survey of Education in the United States for 1937-38 gives the data as shown in Table 1 and in Figure 2. This study follows the first grade group of 1927 through the twelve grades ending in 1938. In 1927 the first graders numbered 4.07 millions. This number decreases to 1.15 millions in the twelfth grade in 1938.

In order to understand better what this table means, we need to consider the population of children who would have been in these

early grades if all had entered school at the age of six or seven years and had been promoted regularly. The 1930 census shows that there were about 2.5 million children of each age from six through ten years. Referring to Table 1, we note that there are more than this number of children in each of the first four grades and that there are about 1.5 million more in the first grade. The explanation of this fact is that these early grades are made up partly of older children who are retarded and that the number of retarded children in the first grade is very large.

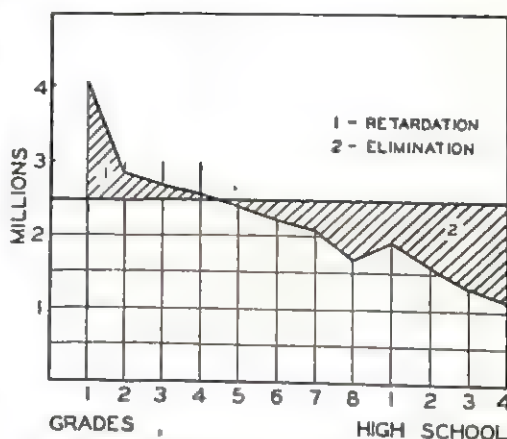


FIG. 2.—Retardation and elimination from school as indicated by grade registration.
For discussion, see text.

TABLE 1. CHANGES IN ENROLLMENT WITH SUCCESSIVE YEARS, BEGINNING WITH THE FIRST GRADE IN 1927 AND ENDING WITH THE TWELFTH GRADE IN 1938 AS SHOWN IN THE BIENNIAL SURVEY OF EDUCATION IN THE UNITED STATES ¹⁰ (P. 9)

Year	Grade	Enrollment (thousands)
1927.....	1	4,073
1928.....	2	2,816
1929.....	3	2,697
1930.....	4	2,599
1931.....	5	2,422
1932.....	6	2,277
1933.....	7	2,120
1934.....	8	1,720
1935.....	1 H.S.	1,912
1936.....	2 H.S.	1,619
1937.....	3 H.S.	1,314
1938.....	4 H.S.	1,150

Beyond the fifth grade, the grade enrollment gets below the number of children of the corresponding age group, and the numbers continue to decline. This means that increasing numbers of children are being eliminated from school: less than half are reaching the twelfth grade. Of those graduated from high school (in 1940), about one-third entered college, and a small number entered other institutions, such as business schools. Elimination continues at a rapid rate in college, and only about half of the freshmen graduate.¹⁰ Elimination is most drastic in the large state universities. In some of these in the past only about one-fourth of the freshmen have graduated with their class. Even in the small private colleges which selected their students more carefully and which gave more individual attention to students, only about half of the students have graduated with their class, although colleges have varied greatly in this respect.

At the time of the 1940 census, 84.0 per cent of the group 19 years old had completed at least the eighth grade, but the percentages for all older age groups were lower. The highest percentage of high school graduates, 45.76, was found for the group that was 21 years old, and the highest percentage of college graduates, 6.32, was found in the group with ages from 30 to 35,¹⁰ (p. 33).

When these maximum figures are compared with those for the educational achievement of the group that were 75 years old or older, it is interesting to note that the percentage of graduates at the high school level had quadrupled (11.53 to 45.76) while the increase at the college level was less, or about 200 per cent (2.25 to 6.32).

(The general picture we get from these figures is that many children in the early grades are retarded: they are not as far along in school as they should be for their age. After dragging slowly through the early grades, these children begin to drop out of school as soon as compulsory attendance laws, or as soon as lax enforcement of these laws, will permit.)

Ayres, in 1909, in *Laggards in Our Schools*, first called attention to this situation. Since then many other studies have shown that retardation is one of our serious problems. Figure 3, which

is based on data from Cornell,⁷ (p. 82), shows the great variability in educational achievement of children of the same age and the resultant great overlapping of the achievement of children of adjacent ages: Actually, although not shown by the graph, the highest achievers at 8 years have a higher achievement score than the lowest achievers at age 13. This is also true even when ages 7 and 14 are compared.

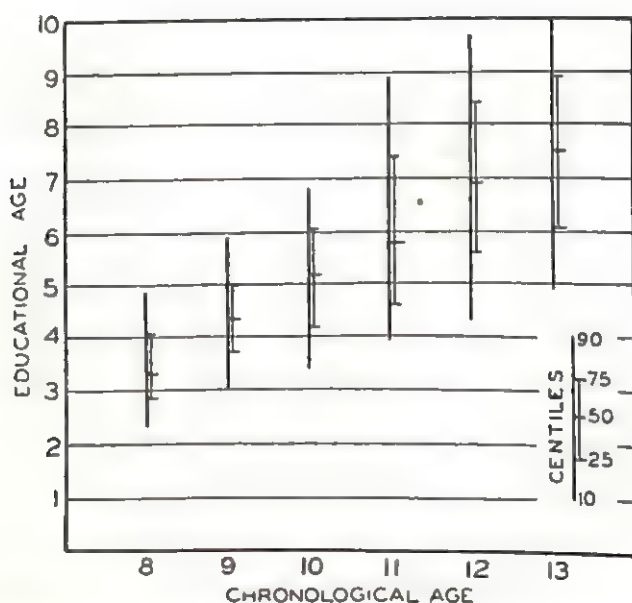


FIG. 3.—Variability in educational age of children at the same chronological age. Based on data from Cornell (7).

Regional Differences.—In addition to the very wide variation in the educational achievement of individuals of the same age, the use of psychological and educational tests has revealed great differences in the achievement of children in different schools and in different areas of the United States. Maller²⁰ studied the variations in intelligence and in other characteristics in health areas in a large city and found that average IQ's varied from 76 to 120. Inasmuch as school populations usually vary according to residence areas, it is evident that school achievement in these different areas would also vary greatly. Edwards⁸ analyzed the results of the 1940 census

for adults who were 25 years of age or older and found that there was considerable variation in the average educational attainments of the residents of different states and that there were also differences between urban and rural areas and between whites and Negroes in average educational level. The highest average reported was 11.7 years for Mississippi urban whites. The average for urban native whites was 9.6 years, and for rural farm whites it was 8.0 years. Rural farm Negroes had the lowest average with 4.1 years.

Because of these regional variations in intelligence and in achievement, it is evident that finishing a particular school grade does not mean the same thing in different parts of the country, and diplomas from different high schools do not represent the same average achievement. And, as we shall see later, colleges also vary greatly in the average intelligence levels of their students.

Grade Overlapping in Achievement.—Until a decade or so ago, it was usually assumed that pupils in school would be required to develop a fair degree of proficiency in a grade before they were promoted to the next higher grade. From this fact one might have assumed that the children in a given grade would show considerable uniformity in achievement even if children of a given age did vary greatly. However, when standardized achievement tests were used and grade comparisons were made, it was found that the variation in achievement within a grade was almost as great as within a given age.) It was not unusual to find that a fourth of the children in a given grade were as poor in achievement as the median of the next lower grade and that another fourth were as good as the median of the next higher grade. About one-tenth were retarded two full years or more and about one-tenth were two or more years ahead of their grade placement. The range of achievement in a single grade was found to be very great. An example of this wide variability is shown in Figure 4. In other words, the system of promotions and failures had not succeeded in grouping achievement. Later studies have shown that some college graduates children in grades so that each grade represented a distinct level of do not do as well as some elementary school children on tests of

arithmetic and of reading. Some high school graduates will do as well as some college graduates on a general achievement test.

The publication of test results showing great overlapping in grade achievements has made us conscious of the problem of classification of students, and various attempts have been made to improve the situation. If there had been no other factors to consider, this

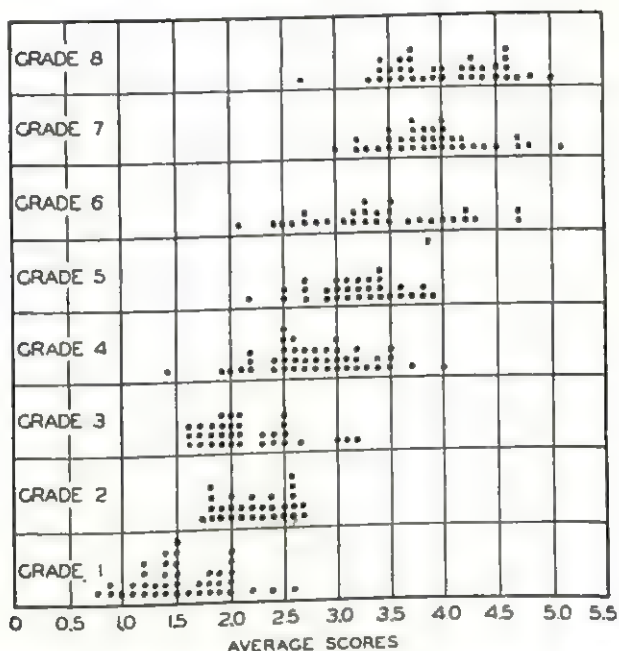


FIG. 4.—Overlapping of total achievement scores of pupils in different grades in school. From Starch after Craig. Starch, D., *Educational Psychology*, Revised Edition, p. 48. New York: Macmillan, 1927.

could probably have been done fairly effectively, but new and different issues were raised to complicate matters.

(Educational philosophers began to emphasize the training of the whole child and to place greater emphasis on social training, on training for democracy, on the development of personality, and on mental hygiene than on the intellectual mastery of the conventional subject curriculum.) The Progressive Education movement tended to break away from the standardized curriculum, from the use of standard tests, and from the emphasis on marks and grades. It

tended to emphasize interest rather than ability. But by no means all educators have accepted the goals set up by this progressive philosophy of education, and we now have everything from extreme conservatism to extreme progressivism in our schools. As a result of these conflicting philosophies and purposes, the problem of classification cannot now be solved in a way that will satisfy the educational world as a whole. In California in recent years groups of parents have been putting pressure on the schools to reduce the "progressive" emphasis and to return to a greater degree to the former emphasis on the development of skill in the fundamentals. Hence we have conflicts of opinion both between different educators and between educators and parents.

One practical result of the new educational philosophy has been to decrease greatly the number of failures and to cause promotion to be based mainly on chronological age. This tends naturally to produce "grades" with a great deal of overlapping in intelligence, in achievement, and in emotional and social maturity.

It is not the proper function of educational psychology to attempt to determine what educational philosophy we should or should not accept. Rather it is our function to point out relevant facts and principles and to show how these may be applied. Psychology can and does enable us, however, to understand better some of the advantages and limitations of different methods such as rote memory drills and progressive activities, and a knowledge of these facts may have an important bearing on the question as to how completely a given educational philosophy is accepted.

Some Problems To Be Solved.—From the facts presented above, a number of problems emerge. What does psychology have to offer to explain retardation and elimination? This involves the question of admission to school, admission to the first grade, promotion to higher grades, admission to high school, and admission to college. What psychological facts and principles have a bearing on the problem of classification? This last question involves especially the homogeneous grouping of students according to ability levels.

Other Factors Involved.—We should not make the error of assuming that these questions are to be settled solely on the basis of an application of psychology. Other factors are also important. In cities where large numbers of mothers are working, there will be more pressure on the schools to open nursery schools and otherwise to admit children earlier. At the high school and college levels, school attendance is influenced by the economic cycle. High school enrollment increases during depressions and decreases when jobs are plentiful and profitable. The increased productive efficiency of our factories is tending to reduce the total amount of employment and to increase the amount of leisure. Unemployment is tending to increase, and competition for jobs is becoming more severe. These factors encourage a longer period of educational preparation before getting a job and they also encourage more adult education.)

Before World War II our birth rate was declining rapidly; families were becoming smaller, and standards of living were rising. These factors tended to encourage more education. As a result, elementary school enrollments were falling and high school enrollments were rising. In the more prosperous states and communities the high school enrollments were relatively highest, and in the least prosperous communities and states they were lowest. Part of this may have been due to differences in native intelligence, but part of it probably represented cultural pressures.

^ Our native intelligence as a people is probably not greatly different from what it was a century ago, but our school enrollment has changed tremendously. These changes are due largely to cultural and economic factors. Consequently, although it is our purpose to emphasize psychological aspects of school problems, we wish to guard against any tendency to conclude that these problems are to be understood and solved solely through the applications of psychology. Other disciplines, such as biology, sociology, economics, government, and philosophy, need to be considered in dealing with various aspects of education.

The most important findings of psychology in relation to the problems outlined above have been in the field of individual differences.) We shall turn next, therefore, to a review of some of these

findings and will then indicate some of their applications to the solution of the problems themselves.

Individual Differences.—It is obvious that people are physically different. If we except identical twins and a few very similar siblings, we ordinarily have no difficulty in distinguishing between any two people. It has also been known for a long time that motor and sensory functions differ greatly in individuals. Even primitive men could see that some men, and some lower animals as well, were stronger and faster than others were, and that some men had better senses than others had. But before 1900 very little was known about differences in higher functions and in intelligence. It was frequently assumed that intelligence was about equal in all except a few abnormal individuals.

(When differences were first recognized, the common tendency was to classify men into different types. In the field of intelligence, men were either geniuses, ordinary normal individuals, or idiots. Classification into types was commonly associated with a belief that there were qualitative differences between types. Geniuses and idiots were supposed to have minds that were different in kind from ordinary minds.)

With the development of intelligence tests, it was discovered that there are all grades of ability from the highest grades of genius to the lowest grades of idiocy. This led to the rejection of the type theory. It also caused us to consider all minds to be qualitatively alike but different in the degree of efficiency with which different functions work. The mind of the genius is like that of the idiot, but the genius learns more easily, remembers better, and is able to solve more difficult problems (Cf. 18, 21).

(Individual differences may be divided into differences within a group, into group differences, including especially age and sex differences, and into differences within the individual.)

(When a single mental or physical trait is measured in an unselected but homogeneous group the measurements can be plotted to give something more or less like a normal distribution curve. Most of the cases will be grouped near the middle of the distribution

and the numbers of cases will decrease from the middle to the end of the distribution. If the distribution is a normal one, it will be symmetrical with the same kind of distribution above and below the average. However, some distributions are not symmetrical and are called skew distributions. In these the cases tend to be bunched toward one end of the scale. Distributions for some characteristics, such as body weight, are really unsymmetrical, but in many cases the skewness is due either to an unusual selection of cases or to errors of measurement. For example, if a teacher gives a very easy test, there will be many high scores, but if a very hard test is given to the same group, there will be many very low scores.

The distributions found for tests of intelligence and of achievement are usually approximately normal.

The standard deviation (SD) of the revised Stanford Binet Test is given as 16 IQ units. Since about 99 per cent of the cases in a normal distribution fall within 2.5 SD's of the mean, about 99 per cent of school children have IQ's between 60 and 140. These figures are obtained by multiplying 16 by 2.5, which gives 40. We then subtract 40 from 100 to get 60, and add 40 to 100 to get 140. The resulting distribution is shown in Figure 5.

To get the practical range of mental capacity at any particular chronological age up to 13 years, we simply multiply the given chronological age by .60 to get the lower limit of the distribution, and by 1.40 to get the upper limit. Consequently, at 10 years our lower limit is a mental age of 6 years, and our upper limit is a mental age of 14 years. On this basis we should expect a normal distribution of children 10 years old to vary in mental capacity from mental ages of about 6 years to mental ages of about 14 years. Similarly, a normal distribution of children 6 years old would vary in mental ages from 3.6 years to 8.4 years.

(This variability obviously has important implications both for the content of the curriculum and for teaching method. Although the average child of six or seven years is ready and able to learn to read, the child with a mental age of four years is not ready.)

When measured by current tests, variation in achievement tends to be great but not quite as great as variation in intelligence.⁷ In

order to eliminate overlapping between grades it would usually be necessary to shift approximately the highest third in a class to higher grades and the lowest third to lower grades.

This difference in achievement results quite naturally from the differences in IQ and in associated mental age. Children with higher mental ages learn more rapidly and learn more difficult material, so that, when they are placed with children of lower

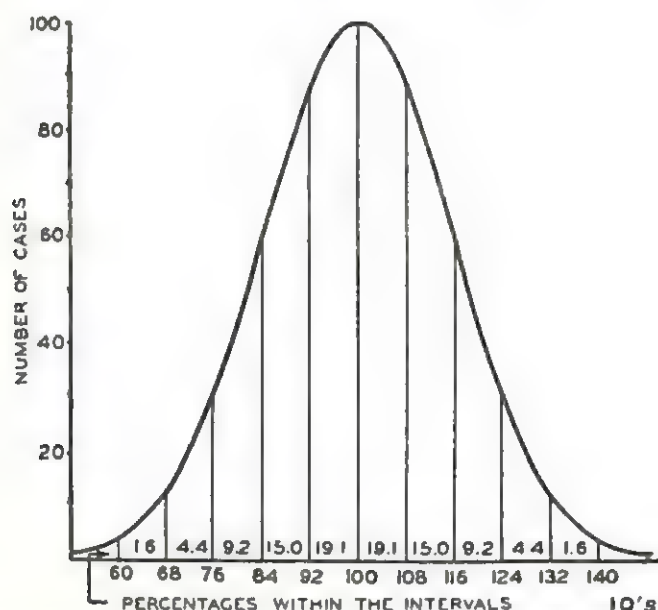


FIG. 5.—A normal distribution of IQ's when the standard deviation of the distribution is 16 IQ points.

ability in the same room and with the same instruction, great differences in achievement quite naturally result.)

Achievement is not, however, perfectly correlated with mental capacity. The correlations usually range from about .40 to about .75, depending on the groups tested and on whether correlations are for single subjects or for total achievement. These correlations indicate that the brightest students do not do work of a quality as high as their capacity, and that the dullest students do work better than one would normally expect from their intelligence tests. Part of this discrepancy is probably due to errors of measurement, but

part is due to the fact that our school system puts more pressure on pupils below the average and permits the brighter students to get by on less than they are capable of doing.

An example of variation in achievement in relation to mental age has been supplied by Strang²⁴ and is shown in Table 2. Children with the lower mental ages show very wide variability in reading scores. However, with increased mental age the variability of the group in reading achievement is markedly reduced. The SD at a mental age of 14 years is found to be much less than it is at 9 years. This indicates either that the poorer readers improve proportionately more than the better ones; or, quite possibly, that more of the poorer readers do not reach the higher mental ages, or that they are eliminated from school.

TABLE 2. VARIABILITY IN READING SCORES AT GIVEN LEVELS OF INTELLIGENCE (STRANG, 24)

<i>Mental Age, Years</i>	<i>Reading Score</i>	<i>Standard Deviation</i>
9.....	9.97	5.55
10.....	17.39	4.67
11.....	21.89	3.09
12.....	24.44	2.86
13.....	28.37	2.95
14.....	29.42	2.39

GROUP DIFFERENCES

Age Differences.—Mental capacities increase with age up to maturity. This process of natural growth, which may be regarded as the development of innate tendencies and capacities, is called maturation. The maturation of capacities is a necessary prerequisite to learning. The infant at six months of age cannot be taught very much even if he is a very bright child for that age. But, as he grows, his capacity for learning increases.

The results of the intelligence tests given in World War I caused some psychologists to assume that intelligence stopped grow-

ing in the average person in early adolescence, but the evidence now available supports the more reasonable conclusion that mental growth continues for about the same period of time as physical growth, that is, it continues until the age of about twenty years.

Most structures and functions grow rapidly at first, but the rate of growth slows down as growth continues. This slowing down of growth is called negative acceleration. The average child at birth weighs about 7.5 pounds and at the age of one year he weighs about 25 pounds. This is an increase of more than 200 per cent in

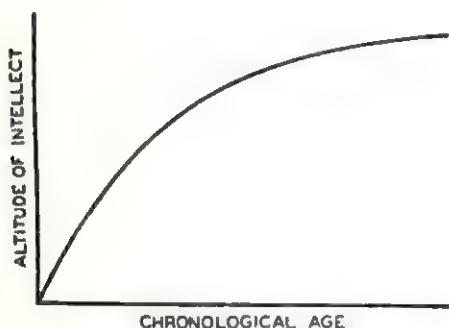


FIG. 6.—The general form of the growth curve for intelligence. From E. L. Thorndike *et al.*, *The Measurement of Intelligence*, p. 466. New York: Columbia University Press, 1927.

one year. If a girl at the age of fifteen years weighed 100 pounds and grew for one year at this rate she would weigh more than 300 pounds at the age of sixteen. Obviously, therefore, later physical growth is at a much slower rate than in infancy.

There has been considerable difference of opinion among psychologists as to the form of the curve for mental growth. However, whenever growth has been measured by ordinary point scales

it has been found that the curve for mental growth is very similar to that for physical growth in that the curve rises more rapidly at first and then slows down so that there is less growth per year as growth continues.¹⁴ This is illustrated in Figure 6.*

There is a fairly definite pattern of growth in that some functions develop earlier and some later. Sensory capacities, with the exception of the kinaesthetic sense, develop quite early and, by the time the child enters school, his senses are not greatly inferior to those

* It is possible that most growth curves are of the sigmoid type and are similar to the curves shown in Figures 14 to 16, but since education is ordinarily not much concerned with the earliest stages of growth, the statement that early growth is more rapid than later growth seems to be correct for the growth of intelligence during the school years.

of the young adult. Rote memory for concrete and particular things also develops early. Rational and associative memory develop more slowly. Capacity for understanding abstractions and for reasoning in abstract terms develops mostly after the age of ten or eleven years, and these functions are among the last to mature.

A good indication of this pattern of development is found in the way children of different ages will describe a picture. Up to the age of seven or eight years, the typical reaction is to enumerate the objects seen in the picture. Thus a boy might say that he sees a dog, a man, a gun, and a horse. Following this stage of naming or enumerating the things seen, there is a period when the account is more detailed, more descriptive, and given more in terms of the action taking place, if any. Thus, for example, a child of eight years might react by saying: "A man is riding a horse and he is carrying a gun across his saddle and a dog is following him." Several years later a third stage appears in which an interpretation of the action is given. At this stage the answer might be: "There is a man who is going on a hunting trip. He has his gun and he is taking his dog along to help him find the game." This interpretation stage first appears typically in the age period from about eleven to fourteen years.

At the same time the power of interpretation is developing in this way, the ability to understand abstract terms, such as beauty, fairness, and proportion, is also making its appearance. With this comes a limited capacity for formulating generalizations. When a fable, such as that of the hare and the tortoise, is read to an average child in the age range from ten to fifteen years, and he is asked to tell what this fable teaches us, the most typical reaction is to make a statement which correctly applies to that particular situation. In this case the answer might be: "The rabbit should not have stopped; he should have kept on running." Only as full mental maturity is approached, and then perhaps only in the brighter individuals, do we get broad generalizations that have a general application. Only a more mature person might be expected to say: "This teaches that overconfidence may cause a superior person to be defeated in a contest by a person of less ability."

As has already been indicated, growth curves have been worked out for general intelligence; and they have also been worked out for different specialized functions. These studies have shown that, as measured by current tests, different functions grow at different rates and consequently have different growth curves. This is illustrated for four different abilities in Figure 7. Rote memory seems to reach its maximum level at about fifteen or sixteen years, whereas vocabulary continues to increase at least to the senior year in college,

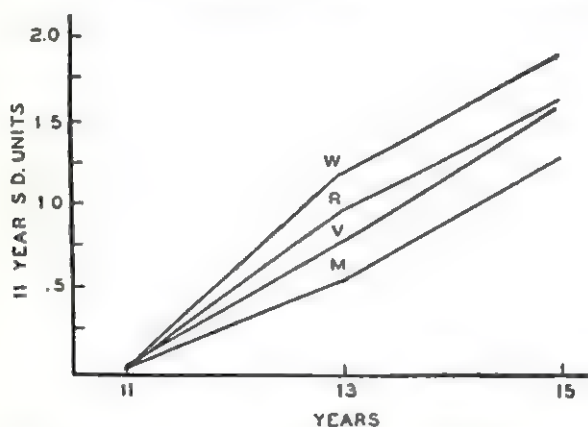


FIG. 7.—Differences in the growth of primary mental abilities. Four abilities are shown: W, word fluency; R, reasoning; V, verbal; and M, memory. The graphs for numerical and for spatial abilities are practically the same as that for memory. From Clark (3). By permission of the Archives of Psychology and the American Psychological Association.

and to even later ages in those who continue to do much reading. Army Alpha subtests show different growth curves: the analogies test reaches its peak at about 18 years and is then above the opposites test, but the analogies test shows a more rapid decline than the opposites test with the result that they are equal at about 32 years.⁵ This fact suggests that there are differences in the rate of decline of functions as well as in their growth rates.

There is also an age change in the correlations between different functions. The results here are not entirely consistent, but Garrett¹¹ has advanced the theory that correlations between different specialized tests tend to decrease with the approach to maturity. This indicates that mental capacity is more generalized in the earlier years

and that it becomes more specialized at maturity. Specifically this would mean that there is less variation in the ability to do reading and arithmetic in the early grades than there is in ability to do geometry and Latin in the high school.

The rate of mental growth of an individual is indicated by his IQ, and the statement has often been made that the IQ tends to be constant. However, actual experimental and statistical studies of IQ changes do not agree very well with that statement. R. L. Thorndike²⁵ has found, on the basis of a careful study of the various experiments on this problem, that in the elementary school period the correlation between a test and one given five years later is about .70. With a longer time interval the correlation would be still lower. Anderson¹ correlated intelligence test scores for 130 girls at 7.4 years and 16 years, a difference of 8.6 years, and found a correlation of .542. For a group of 135 boys of the same ages the correlation was .582. This gives an average correlation of about .56, which agrees well with what would be expected on the basis of Thorndike's conclusion as stated above.

(These correlations show that the IQ is far from constant over a period of several years. Bright children in the early grades do tend to be bright in later grades and dull children tend to remain dull, but individual IQ's, as measured by current tests, do show some large changes, and for this reason any school classifications that may be made on the basis of tests of intelligence will need to be flexible and subject to change. Part of these changes may be due to errors of measurement and part may be due to actual changes in the rate of development of the children concerned, but we are not now able to discriminate with any accuracy between these two sets of factors.)

(It is also important to note that those children who are intellectually superior tend to be superior in personality and character traits as well.) As an example of this, Lewis¹⁸ has compared an accelerated group, with an educational age one year or more above the mental age, and a retarded group with an educational age one year or more below the mental age. He reports the accelerated group to be more dependable, more original, more self-reliant, and more disposed

to make independent investigations. In contrast, children of the retarded group have less desirable personality traits, show relatively more interest in motor activity than in intellectual activity, and also tend to come from inferior homes. It might also be added, on the basis of other investigations, that retarded children tend to have more physical defects, are more often absent from school, and are more likely to become delinquents. In general they tend to become problems both in school and out.

Sex Differences.—Measurements of physical growth show that girls grow relatively more rapidly than boys and mature two or

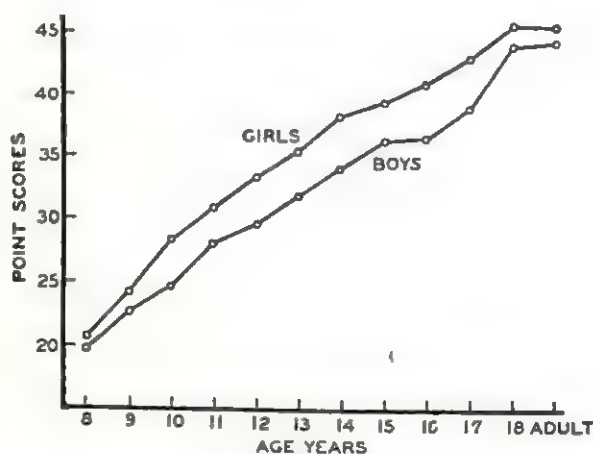


FIG. 8.—Mental growth as measured by verbal tests. From W. H. Pyle, *The Examination of School Children*, p. 39. New York: Macmillan, 1913.

three years earlier.) The girl of twelve years is physically about as mature as the boy of fourteen years. Measurements of mental growth have given somewhat conflicting results, but, when tests have not been constructed to make the sexes equal, there is a definite difference in favor of the girls of at least six months at the age of twelve years.⁹ When special abilities are measured, the differences are at times marked. Girls are considerably better than boys in languages, and they are usually credited with having a better memory. Boys, however, are usually better in mathematical subjects and in mechanics.

Figures 8 and 9 show sex differences in the growth of different functions. Figure 8 is based largely on remembering verbal material, at which girls are better. Figure 9 is based on the Ferguson Form Boards, and, in this case, the boys are better. However, the variation within each sex is much greater than the average difference between the sexes.

(Girls develop emotionally more rapidly than boys; and, although we do not know exactly just how great this difference is, it seems

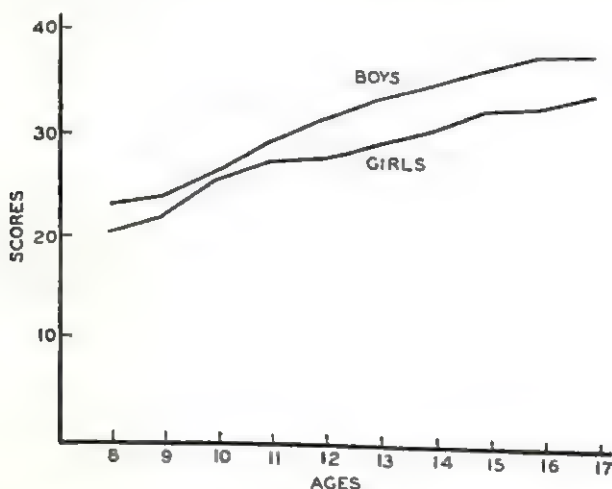


FIG. 9.—The growth of ability as measured by the Ferguson form boards.
From Wood and Kumin (29).

probable that sex differences in emotional development are as great as the known differences in physical development.) This would mean that the girls at twelve years is emotionally as mature as the boy at fourteen; although here, also, there is wide variation within each sex, with the result that some boys at twelve are emotionally more mature than some girls at twelve. At the present time we do not know accurately just how much the two groups overlap because we do not have tests which permit accurate measurements of emotional maturity.

(Differences within the Individual.—As science advances it analyzes. At first we studied individual differences in terms of

mental ages and I.Q.'s. Then it appeared that two children might have the same mental age but that one might be bright in one respect and dull in another respect while the other child might reverse this pattern. Jean and Joan might make the same total score on an achievement test but Jean might be much better in reading and Joan much better in arithmetic.

American psychologists have been particularly interested in analyzing ability into separate abilities.* We have definite evidence that abilities in arithmetic and in language are fairly distinct and that ability in one is no guarantee of ability in the other. In the same way the capacity to visualize is independent of the capacity to form auditory images or to remember things in auditory terms. Even such a relatively simple characteristic as visual acuity has been found to vary at different distances.¹² Two children who have equally good vision at twenty feet may differ considerably at other distances.

Intelligence has been analyzed into a number of more or less fundamental or "primary" abilities. These include such abilities as verbal ability, numerical ability, spatial ability, inductive and deductive abilities, memory, perception, and perceptual speed.¹⁵ In practice we are likely to find that these primary abilities are complex and are subject to further analysis.²⁰ One may be excellent in dealing with the perception of static space in two dimensions but may be comparatively weak in dealing with movement in three dimensions.

Numerical ability varies in the same individual according to the function tested. One pupil is relatively better in addition, another pupil is better in multiplication.) One pupil has a special difficulty in multiplication with zero combinations, such as 0 times 3, while another pupil has special difficulty with combinations of 7 and 9. In this sense, individual differences are often highly specific.

(This specificity, plus other factors, affects success in the same subject at different levels. Achievement in a subject in high school does not correlate very well with achievement in the same subject in college.) In one study,¹⁸ achievement in high school in the exact

* The terms "capacity" and "ability" are often used practically as synonyms, but when they are used more precisely, capacity refers to innate potentialities, as capacity to learn a language, whereas ability refers to actual capability at the time, as ability to play the piano.

sciences correlated with college achievement only to the extent of .15. English showed the best correlation, but even this was only .49. Such correlations indicate that high school achievement in particular subjects does not afford an adequate basis for predicting college achievement in the same fields. Some college teachers of the physical sciences have even gone so far as to express the opinion to the writer that training in high school physics and chemistry is often detrimental to success in college in the same subject. This, if true, can hardly be said to simplify the problem of those charged with the selection of students for admission to college.

Interpretation of Statistics.—It is now possible to understand somewhat better the statistics presented for school retardation and elimination. The curriculum in the early grades has been based on the development of the average child. Consequently those children who deviate very far from the average do not find the work very well adapted to their needs. The above average children do not find enough to do, and the slow children find the work too hard. In the past, many of these slow children have failed to earn promotion and have been required to repeat the grade. This was especially true at the first grade level, and a large proportion of children were kept in the first grade for a second year.)

These less capable pupils have been discouraged by inability to succeed in the work expected of them and they have tended to drop out of school as soon as circumstances permitted.

The relation between intelligence level and elimination from school has been shown quite clearly in a study by Benson² who determined the later educational achievement of 1680 pupils who were in the sixth grade in Minneapolis in April of 1923, and who were given the Haggerty Delta 2 Intelligence Test. Those who entered high school, but did not graduate, had a median score of 108. Those who graduated, but did not enter college, had a median score of 120. Those who took graduate work had a median score of 134. However, there was considerable overlapping of groups and 25 per cent of those not attending college had scores above the median of those who graduated from college. College attendance was, there-

fore, evidently influenced by factors other than ability to do college work. This would include such factors as financial position, marriage plans, and academic interest.

This study is supported by military data. The men in the armed forces who made the highest scores on the intelligence tests tended to have remained in school longer than those who made lower records, although here again there was much overlapping of groups. Some of those who quit school comparatively early made high scores on the intelligence tests.

Girls develop mentally and emotionally more rapidly than boys so that a smaller proportion of girls have found the work of the school too hard for them; fewer have been retarded, and fewer have been eliminated. Another difference which favors girls is that they seem to object less to indoor sedentary work. Boys are more interested in motor activities and, as a result, are more restless when confined indoors.

Toward the end of the secondary school period the boys tend to catch up with the girls in mental development. Since boys have been somewhat more drastically eliminated from school before this time, the boys who finish high school seem to be on the average brighter than the girls. Partly as a result of this, and partly as a result of vocational needs, boys who graduate from high school are more likely to go to college. Consequently, although more girls have finished high school, more boys have gone to college.

Girls make better average grades than boys in college, but, in spite of this, the statistics presented show that they were less likely to graduate, and still less likely to continue for graduate work. Comparatively few women are enrolled in professional schools. Comparatively few women take advanced degrees.

Women marry earlier than men and this is one of the reasons why girls are less likely to finish college. There is less pressure for women to finish college for vocational reasons, and when a family is not able to send all children to college it is likely that more often boys will be sent rather than girls. These factors would seem to account mostly for the sex differences in enrollment at the college level.

APPLICATIONS TO PROBLEMS

Admission to School.—At what age should children be admitted to school? The answer here will depend on what we intend to do when the child enters school. For the conventional first grade curriculum in which the primary emphasis has been on learning to read, the answer usually given by experimental studies is that a mental age of about 6.5 years is necessary if reading instruction is to be really profitable. Children with lower mental ages can learn to read, but the amount learned hardly seems to justify the effort. Probably the time spent on reading could be more profitably spent in developing a better background for reading.

After considerable experimentation, Hobson¹⁷ arrives at the conclusion that for admission to kindergarten a mental age of 5 years and 2 months is desirable, and for admission to first grade a mental age of 6 years and 2 months is necessary for the best results. After this rule had been thoroughly tested it was unanimously supported by 10 elementary school principals and 18 first-grade teachers, but 8 out of 10 kindergarten teachers favored admission to kindergarten on a straight chronological age basis. This would seem to indicate that kindergarten work in this instance did not actually require average mental capacity, and, as a matter of fact, much kindergarten work is of such a low intellectual level that it could be done by children of younger ages.

Learning capacity depends mainly on mental age. Consequently, if two children are five and nine years old, but both have mental ages of seven years, they will at first make about the same progress in learning to read. However, since the younger child is growing faster, he will be ahead of the older child by the end of the year.

Since it will usually not be feasible to keep slow children out of school until they have a mental age of six years or more, this problem can be solved by putting them into special sections and giving them special work similar to what average children get in the kindergarten.

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If the work of the first grade is conducted on an activity basis, and if immediate capacity to learn to read is not stressed, it is not

so important that the entering children have mental ages of six years. Those of lower mental capacity can fit into the group activities without much difficulty, although they will, of course, not learn as much as the brighter children learn. Eventually some adjustment for the slow pupils will need to be made, but it can be postponed in large measure in an activity program.

For admission to kindergarten and nursery school no special requirements are necessary except perhaps some chronological age limit. Learning is possible at all ages from birth to death. Nursery school and kindergartens can offer some advantages certainly over poor home environments. And they may offer social advantages not found in many excellent homes.

Some workers have claimed that attendance at kindergartens and nursery schools permanently increases the IQ, but these claims have not been generally accepted. There should be little question, however, that training can increase a child's vocabulary and can have a beneficial effect on the development of knowledge and concepts. And, if this is true, the child will as a result score higher on present intelligence tests. One group argues that this represents a real increase in intelligence, while an opposing group holds that this is essentially an increase in achievement. In either case, there may, or may not, be real advantages to the child in attendance at a good nursery school or kindergarten. Probably the child from a good home, who receives adequate attention from his parents and who has other children to play with, is not especially helped by kindergarten attendance, while the child from a less satisfactory environment should be benefited.

(Once the child has entered the first grade, there is usually no further problem of admission until he reaches the college level.

At the college level there is great variation in practice. Some state universities admit practically any student who has graduated from a high school. Other state universities have a list of formal subject requirements. Private colleges and universities show more extreme variation than is found in case of the state institutions. Some colleges have rather rigid subject requirements and others require no specific pattern of subjects. There is also great variation in the

quality requirements. Some will take applicants with low grades while others require relatively high class rank.

Traxler²⁷ has called attention to the wide variation in the average performances of students in different colleges on the American Council Psychological Examination (ACE). On the basis of the 1937 report, the 25th centile score of the *highest* college was 118, but, in contrast, the 75th centile score of the *lowest* college was 102. From this it appears that the highest ranking students in the lowest ranking college were about on a par with the lowest ranking students in the highest ranking college. Similar variations have also been noted at the high school level,²¹ (p. 6). It is, therefore, quite clear that different school populations vary greatly in performance.

Educational research has tended to indicate that the requirement of patterns of subjects for college admission cannot be justified in the case of colleges of liberal arts. In case of technical schools, such as engineering and medicine, definite requirements of prerequisite courses are obviously necessary, but some of these courses may not be as necessary as is often supposed. The writer has found evidence in informal checks in three higher institutions that students who did not take physics and chemistry in high school did better work in college when placed in courses with students who had had such high school courses. The reason for this is not entirely clear, but there are probably at least two factors involved: when a student has had a course in high school, the college course will lack the interest that is based on novelty; and the student who has done well in a course in high school is likely to think that he knows more than he actually does know, with the result that he does not study the college course as carefully as he otherwise would. This whole problem needs careful experimental study in order to determine the actual validity of present college entrance requirements.

(The factors on which success in a college of liberal arts seems chiefly to depend are: high intelligence level, academic interest and ambition, good study habits, and proficiency in the English language—which includes reading, oral and written expression, and note taking.)

In particular cases, the average level of intelligence will not be as important as the nature of the individual's profile of special abilities. The language student will obviously require a high order of verbal ability, but he may do quite well in spite of marked weaknesses in spatial perception and in dealing with numbers. The engineer, in contrast, will require a high order of mathematical and spatial abilities but may be somewhat weak in linguistic ability. Special abilities and disabilities should, therefore, be considered in admitting students to particular types of college courses.

After World War I, it was demonstrated that students who had not finished high school, but who could make high scores on intelligence tests, could and would make good records in college courses in competition with students who had been admitted to college in the regular way.

There are various ways in which probable fitness for college may be determined. One progressive college requires the student to offer credit in ten units of "solids" and to be in the upper third of the senior class in high school. The ten units of solids are important in supplying a general cultural background for college work. They also indicate something as to the academic interest of the student and give a better indication of the student's ability to achieve success in a difficult subject. A psychologist once commented that the requirement of four years of Latin for admission to college could not be defended, but that it worked very well: any student who had met such a requirement with credit could do satisfactory work in college and usually would do such work.

(When applicants do not have satisfactory high school records, good predictions can be based on the use of intelligence tests, reading tests, general high school achievement tests, and interest tests.)

(High school grades are frequently unreliable and so are other grades as well, and, for this reason, the high school record, plus the scores of achievement tests, gives a sounder basis for college admission than can be had from the use of high school record or tests alone.)

(Personality and character traits are also important in connection with college admission. These are usually checked by letters of

recommendation, by rating blanks, and by interviews. These methods are unreliable and for this reason it is desirable to have two or more raters, especially in doubtful cases. Personality tests are also unreliable and are of questionable value to determine fitness for college admission. Much research is now being done in this field, and really useful personality tests may be developed in the future.

CLASSIFICATION

We have noted that with the exception of identical twins no two individuals are genetically alike, and, because of inevitable differences in experience, even identical twins must be mentally somewhat different. For this reason individual instruction seems to some educators to be the ideal, and some systems of instruction have been set up with the aim of making instruction as nearly individual as possible. These individualized systems usually assume a preliminary classification, as on the basis of chronological age, and attempt to individualize instruction within these age groups.

However, individual instruction is not likely to become the general practice for three reasons: it is too expensive, it requires better trained teachers and more equipment, and it lacks the social values to be attained by group work. Attention to the needs of individuals will be emphasized, but this will be done after some kind of classification rather than without classification.

There are many varieties and degrees of opinion about classification, but it will be sufficient for our purposes to outline two divergent views.

Some educators oppose grouping on the basis of ability and favor grouping on the basis of chronological age. This is the position of many of the Progressive education group. They emphasize social training and personality development and do not believe that ability grouping is favorable to the attainment of their aims. Individual differences in ability are to be taken care of by assigning different tasks in connection with the various group activities engaged in. In these activity programs, sub-groups may be organized from time to time on the basis of interests in particular projects or topics.

At the high school and college levels, according to this theory, differences in interest will cause the selection of different courses and this will produce homogeneous groups. Extracurricular activities will bring together other homogeneous groups with similar interests.

These educators are opposed to ability grouping because they consider it to be undemocratic and because they think it tends to develop inferiority complexes in those children classified into the lower groups and to develop superiority complexes in the children placed in the superior group.

This question involves some rather fundamental psychological problems which it is desirable to face frankly. In a recent contribution,²⁸ Snygg and Combs have very ably supported the thesis that the activities of each pupil in school are aimed at his self-enhancement. In school or out, he is constantly influenced in his attitude toward activities by his judgment as to the way in which they are likely to contribute to his self-esteem—or the opposite.

In line with this idea, a survey¹⁹ of children in the fourth, fifth, and sixth grades shows that both they and their parents would prefer that they be in the bright group in a school in which the pupils are classified into bright, average, and slow groups. However, both the average and the slow pupils would shift to a lower group in order to get a better teacher. In other words, they rate satisfactory learning conditions as being more important than being in a bright section. The bright students, in contrast, would stay in the bright group even though the teacher were not so good. This study also tended to show that sectioning on the basis of ability tended to develop something of an intellectual caste system, and that this influenced the choice of associates outside of class.)

This last-mentioned result is not peculiar, however, to societies that practice the classification of pupils in school on the basis of ability. There is ample evidence that marriages involve assortative mating, i.e., those of high intelligence tend to marry people of better than average intelligence, and those of low intelligence tend to marry people of less than average intelligence. In out-of-school social affairs there will be differentiation and segregation on the basis of intelli-

gence and other characteristics regardless of practices within the school.

As stated above, the opponents of classification on the basis of ability urge that the practice is undemocratic and therefore objectionable in a democratic country. This, of course, raises the question as to the extent to which it is possible or desirable to extend democracy in a practical world. Some would support democracy in the way of political, economic, and educational opportunities, but would point out that if equal opportunities and rights are given to all, there will, none the less, be marked differences in achievement which need to be taken into consideration if school instruction is to be most effective.)

(Advocates of ability grouping, in turn, offer certain objections to the theory and practice of grouping on the part of the Progressive education group. In an activity carried on by a group, the tendency is for children weak along some line to leave that for other children to do. Hard problems in arithmetic are done by those proficient in such work. As a result, those who are weak escape the special attention necessary if their weakness is to be corrected. In actual life each individual must very largely solve his own problems: he cannot so conveniently sidestep his difficulties and leave them for some more gifted person to solve.

(Interests are not a satisfactory basis for grouping, for the reason that the interests of young children are very fickle. Furthermore, one of the purposes of education is to develop new interests, and this requires work on subjects and topics and projects that may not at first be of great interest. Real interest in things depends on knowledge of these things and proficiency in them. The student must learn science and mathematics before he knows whether or not he has much interest in them.

(Interests and abilities are not very closely related, although they are positively correlated. Also, the ratings secured on vocational interest tests frequently disagree with an individual's expressed interests in different vocations. One college man asked the writer to suggest a vocation in which he would be interested. Real estate was suggested and the student at once said that he would not like

it, but on the Strong Vocational Interest Blank his rating for Real Estate was A. Children often think they are interested in a subject or in a vocation, but when they learn more about it they may find that it is not what they thought it was. On the other hand, experience with a subject may result in the development of a permanent interest.

One of the marks of emotional maturity is the ability to work toward remote goals. This means that work must be done that is not immediately and directly interesting. Young children will, of course, be lacking in this capacity, but, on the other hand, it is hardly the best educational training to permit them constantly to work only on the things in which they are immediately interested.) As maturity is approached, it is to be expected that plans for a vocation will be made and that educational efforts will be directed specifically toward that goal.

(It is also pointed out that, if the greatest social values are to be gained, the groups need to be of similar abilities. Individuals who are too unlike do not make good social groups. A social group is more than a number of individuals assembled in the same place: they must have some coherence and organization. Hence, it is urged, ability grouping favors social participation.)

(Proponents of ability grouping also answer the arguments against such grouping by saying that inferiority and superiority complexes are more likely to develop in groups where the competition is very unequal.) The idea that placing a child in a group of lower ability attaches a special stigma to him is answered by saying that children, without the benefit of intelligence tests, inevitably rate each other and do so with surprising accuracy. The "slow" child is very likely to be rated as slow by his associates whether he is placed in a slow group at school or not. What is more, each child will need eventually to make a life adjustment on the basis of the ability he actually has. If his IQ is no better than average, he will not succeed in law, medicine, or engineering, and the sooner he accepts this fact the better it is for all concerned. College teachers are familiar with examples of students whose ambitions outrun their abilities.) When the individual waits until the age of twenty or later to discover his limitations, the emotional shock is likely to

be much greater than if the knowledge came early. There is also the question of effective utilization of time. Some students spend a great deal of time and effort working toward a vocation for which they are not fitted. Eventually they have to give this up and prepare for some other kind of work. Much time could have been saved if they had made the change earlier.

In spite of the various objections to ability grouping, a limited survey by Wallin in 1941 and 1942 showed that 67 per cent of the schools practiced sectioning.²⁸ Some other schools made other provisions for individual differences. Sectioning on the basis of ability was favored generally for skill subjects though not so much for other activities.

At the high school level, sectioning on the basis of ability is most likely to meet with approval in mathematics and is perhaps most often opposed in the social sciences. Teachers of mathematics are concerned with the development of definite insights and skills and are not as a rule much concerned with the development of democratic attitudes. Under these conditions, sectioning is usually favored. Sleight,²² for example, reports the successful use of sectioning with five levels of ability in the first year of high school, with four levels in the second year and with three levels in the third year. If, however, a teacher is mainly concerned with the development of social attitudes, the usual arguments for classification on the basis of ability do not hold, but we might eventually arrive at a classification on the basis of attitudes in a manner to facilitate instruction. Possibly some would be found to have the approved attitudes at the beginning of the course and so could be excused!

(The majority of teachers are found to favor sectioning because discipline is less of a problem and the work of the teacher is generally easier.)

(The experimental evidence on ability grouping is mixed. Some experiments have shown very favorable results, although others have not. It is fairly generally recognized, however, that ability grouping alone is worth very little. To obtain the best results, changes in the curriculum and in teaching methods must also be made, and the teachers involved must be sympathetic to the changes.)

Experiments on ability grouping which have followed the usually sound principle of having only one variable different between the control and the experimental group have been at fault, because, as indicated above, ability grouping must be accompanied by other changes if the best results are to be obtained. For this reason, many experiments that have shown negative results are to be disregarded.

After successfully using ability grouping, Cole makes these comments,⁴ (p. 23) :

The advantages to the pupil are as follows: He matches his ability only with those of equal strength; is measured by a standard just and fair to him; the assignment is made according to his ability; he performs the work and receives a passing grade.

The teacher also is greatly benefitted in being able to adapt the work to the ability of her class; she detects any weakness and applies a remedy; her time is spent to keep the students busy, hence discipline is reduced to the minimum; and finally she is better able to measure the achievement of each person and give him the benefit of righteous judgment.

Comments by pupils are also given. Group I: "I have to work harder and play less, I learn lots more, I do not have to wait for those who cannot work as fast as myself and thereby waste good time. Working is much more interesting because I have a purpose in mind and not the spirit of just getting through the grade." "When there were slow and fast ones together, I did not get my lessons because I knew there would be others that would not have them; but now I work to keep up with the class. I can do it if I just try."

Group III: "I have gained a great deal by having the grouping system. When I was in the sixth grade it was hard for me to keep up, but this way we have now, it is easier for me to keep up." From a girl who had failed in two grades: "I like the grouping system because before I was not able to work as fast as the others but since they have the grouping system I am able to keep up with my class; also the work seems to come easier to me."

Group IV: "I like the grouping system because you learn more. You don't have to always be last in your studies, and the work isn't

too hard for you." "It gives me a chance to keep up with the class." "The ones behind get discouraged and don't feel like doing anything. Taking the work slower I get more out of it."

In general the records show lower percentages of failure under the grouping system. This probably results in part from a relaxation in the requirements for the lowest group, but it also appears to result from the fact that the slow group actually learns more under the grouping system.^{6,7} \

Methods of Grouping.—The size of the school system will determine the extent to which ability grouping is possible. In small school systems, there will not be enough pupils in a grade to justify making two classes. In this case, however, it is usually possible to organize sub-groups within each grade and to vary the work for these sub-groups. This can be made a very effective means of adapting the work to the individual needs of the pupils.

When two sections are possible at each grade level, the slower group is usually made smaller because the slow pupils usually require more individual attention.

When five sections are possible for two adjacent grades, the slow and the average pupils from each grade are placed in separate sections and the brightest pupils from both grades are placed in the same section. One teacher can handle these two groups much more efficiently than one teacher can handle two slow groups.

When three or more sections are possible in each grade, there is no serious problem in the early years. Children of the same chronological age are placed in a grade and are sectioned according to ability. This keeps children of approximately the same physical and social development together, and the ability grouping makes them similar in learning capacity.

In sectioning according to ability, attention needs to be given to IQ and to both general and special achievement. If sectioning is based on IQ's, there will still be wide variation in achievement.^{6,24} For this reason, the use of achievement tests, either instead of, or as a supplement to, intelligence tests seems desirable. In general it would seem that in the earlier grades more weight needs to be

given to the IQ, while in the later grades relatively more weight should be given to achievement scores.

In later grades, when different subjects are studied, a problem arises from the fact that children may vary greatly in capacity in different subjects. A pupil may, for example, be excellent in reading and poor in arithmetic. Total achievement and IQ in these cases may both be average. However, if such a child is placed in an average group, the reading will be too easy and the arithmetic will be too hard. The theoretical answer to this problem is simple: section in each subject on the basis of achievement in that subject, or perhaps on the basis of the best prognostic tests.

In practice, difficulties may be encountered because of schedule problems, but these can be prevented by placing all sections of the same subject at the same hour. In that case, however, a different teacher will be required for each section, and it will usually be necessary for a teacher to teach a number of different subjects. Below the high school, this may be a practical solution, but in the high school, it will not ordinarily be possible or desirable to solve the problem in this way. It does not seem, therefore, that there is any solution that is entirely satisfactory.

(Placing children of the same chronological age together also encounters difficulties in that there is wide variation in the physical and social development of children of the same age. To this is to be added the fact that there is a considerable difference between the sexes in the rate of physical and social development. This difference is especially important at about the age of twelve years. At that time girls have a level of social interests which is considerably in advance of the interests of the boys. For this reason, if social training is to be emphasized, and if we are to attach any importance to the factor of readiness, we shall need to classify children on the basis of physiological and social maturity. The development of democratic attitudes presumably depends on maturation as well as on training, and if this is the case, a classification on the basis of levels of social maturation should contribute to the effectiveness of instruction in democratic ideals.)

At the high school level, the slower students, if still in school, will need to be placed in separate groups doing work adapted to their capacity. They should not be permitted to take such subjects as algebra, Latin, and physics. However, in communities where attendance laws permit, these slower students usually drop out of school and consequently are no longer a problem.

Sectioning into two groups at the high school level has been used successfully. The top group is made up mostly of those expecting to go, or qualified to go, to college. The other group is made up of those for whom high school graduation is the end of their formal education. If this grouping is followed, there may well be some overlapping of ability. More practical work will usually be given to the terminal group. The college group must, of course, meet college entrance requirements.

At the college level, sectioning on the basis of ability has been used in courses especially in the freshman year. Held¹⁶ reports that at the University of Pittsburgh placement tests have been used in mathematics, and students with low scores have been placed in a special section. As a result, failures in mathematics dropped from 21 per cent to 6 per cent. Morale in classes is reported to be better. After one semester in the special class for the low group, students qualify for the regular mathematics work. In this study, placement tests proved better than entrance units as a basis of sectioning.

Tests have also been used widely in English and in foreign languages as a basis of sectioning students in lower division courses. In upper division courses, because of elimination, the students are usually of higher average ability, with the result that sectioning on the basis of ability is less necessary.

QUESTIONS AND EXERCISES

1. What have been the chief trends in school enrollment since 1900?
2. How may we account for geographical variations in school achievement?
3. What theory of individual differences has replaced the type theory?
4. What are the most important psychological sex differences?
5. What are the chief facts about intra-individual variability?

6. What are the most important mental growth changes between age 7 and age 15?
7. Why is variability in achievement very great both for children of the same age and for those of the same grade?
8. Why are intelligence and achievement not perfectly correlated?
9. Why is failure in school psychologically objectionable?
10. What are the chief steps necessary to prevent failure?
11. In schools in which promotions are automatic, how does educational retardation occur?
12. Summarize the arguments for and against classification of pupils on the basis of ability.
13. Why is variability greater in single subjects than in average achievement?
14. To what extent do the brightest high school graduates go to college? What non-intellectual factors influence college attendance?
15. Why is it difficult to predict accurately success in college?

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CHAPTER 3

THE CURRICULUM

Educational Aims.—Before we can determine the content and organization of the curriculum, we need first to define the aims of the educational program. In order to adjust successfully and happily to our modern industrial civilization and culture, it is evident that the child must learn many things. The most fundamental and general aim, therefore, of the schools is to assist children in making better life adjustments.

If we attempt to be more specific in our statement of aims, we shall find it necessary to take many factors into consideration. The needs of children will vary in different cultures and at different stages of growth and development, and children of the same age in the same culture will have different needs because of differences in interests and capacities and other differences such as those in the social and economic environments in which they live. The sound educational practice then would seem to be to approach the problem of curricular content by studying the needs of the children to be trained.

A list of ten "Imperative needs of youth" has been supplied by Elicker⁹ and a group of associates. These, briefly stated, are as follows:

1. To develop the salable skills and related understandings and attitudes necessary for economic success.
2. To develop health and physical fitness along with the knowledge and habits necessary to maintain these.
3. To gain an understanding of the rights and duties of citizenship, along with the attitudes necessary for good citizenship.
4. To acquire an understanding of the family and of the conditions of success and failure in family life.

5. To learn how to be an intelligent consumer: to purchase and to use goods and services efficiently.

6. To understand science and scientific method as related to man and the modern world.

7. To develop an appreciation of beauty in literature, art, music, and nature.

8. To learn to use leisure time so that it will be most beneficial both personally and socially.

9. To develop ethical insight and principles and a sense of the highest ethical values.

10. To develop skill in rational thinking and expression—to be able to read or to listen or to write or to speak effectively.

No statement of needs is likely to satisfy everybody, but this formulation does seem to be reasonably adequate. In so far as we accept it, we can say that the aim of education is to train children to meet these needs.

Problems of Curricular Content.—The problem of the curriculum maker is to determine the particular skills, knowledge, insights, attitudes, and habits that are likely to be of the greatest value in satisfying these needs. Since time and learning capacity are limited, it will be necessary to limit the content of the curriculum. This, in turn, will require that decisions be reached as to the relative importance of the different needs and the amounts of time that can best be devoted to each. And since individual children differ greatly both in their needs and in their capacities for learning, it will be necessary to consider psychological facts and principles if we are to determine the best curricular content.

Problems of Curricular Organization.—How is this content of the curriculum to be organized? The conventional pattern of organization has been into subjects arranged into a graded series from the first grade through the university. This pattern of organization has been subject to a great deal of criticism, and substitutes have been tried which involved the study of broader fields or of projects that overlapped various subject areas. Although recent studies show that there is a tendency in the direction of breaking

down the sharp divisions between subjects, they also show that in most schools the prevailing organization is in terms of subjects arranged by grade levels.

This raises some questions as to what is to be taught at each grade level. And these questions will arise regardless of whether arithmetic is taught as a separate subject or as a part of some larger unit. When should we teach common fractions? Or in greater detail, when should we teach halves, quarters, thirds, fifths? When should we teach decimal fractions? When should we teach column addition of different levels of difficulty? Is commercial arithmetic better adapted to the eighth grade? Or to the twelfth grade? Or to some other grade? Should we follow the conventional practice of teaching algebra before geometry or reverse the order as recommended by Judd?

Similar detailed questions will arise in connection with the teaching of all other subjects, and since psychology is concerned with learning, it would seem that psychology should be able to offer assistance in determining the grade placement of anything that may be included in the curriculum.

There are also questions as to the best organization of the material in a given subject in a given year. Early texts in general psychology usually followed what was considered to be a logical organization: they began with chapters on subjects that were considered to be simpler and more fundamental, and ended with chapters on more complex topics. The recent tendency, in contrast, has been to attempt a more psychological approach, although different writers have not agreed on the best way of doing this. This problem will not be discussed in this chapter but will be considered in later chapters on teaching procedures and methods.

In Chapter 2 it was pointed out that there are wide variations in the learning capacity of different children in school and correspondingly wide variations in their achievement and in the length of time they remain in school. For these reasons no one standardized curriculum will be found to be adequate for all: rather it becomes necessary to develop a curriculum which permits wide adjustments to the needs of individual children.

From this general view of curricular problems we shall now turn to a consideration of some of the more important psychological facts and principles that have a bearing on educational aims, and on the content and organization of the curriculum.

PSYCHOLOGICAL PRINCIPLES

Transfer of Training.—Before 1900, educators commonly believed that the mind consisted of a group of faculties. One common classification of these faculties was: the intellect, the feelings or emotions, and the will. In some cases the intellect was divided into less inclusive faculties such as power of observation, memory, and reasoning. Each of these faculties was assumed to be an independent unit and it was further assumed and believed that appropriate training would improve these faculties so that they would function more efficiently whenever used thereafter. Acting on the basis of this psychology, it was commonly stated that one of the primary purposes of education was to train and to improve the faculties.

The past tense has been used in the preceding paragraph because scientific psychologists no longer accept the faculty psychology; but many educators do accept it, and our curriculum still shows evidence of its survival.

It was further believed that the best training was to be secured through the study of hard subjects which would require considerable concentration and effort. It was considered desirable that these subjects be definite, clear-cut, logical, and well organized. It was believed that minds trained on such material would tend to become more logical and better organized.

On the basis of such an educational theory, it was quite natural that Latin, Greek, mathematics, and logic should have come to be considered ideal subjects for study. It was not considered especially important whether these subjects were to be used in later life or not. The important thing was that those students who studied with proper diligence would improve their minds so that these would be of a higher level of ability than they otherwise would have been.

This doctrine of the improvement of mental faculties through the study of appropriate subjects was known as the doctrine of

formal discipline, and this is at times referred to as the disciplinary view of education.

Most of our more literate adults have heard about the IQ and have been told that it is constant. The claim that the IQ is constant is an overstatement, but it is true that, as far as group averages are concerned, we have not found that the study of any subject results in any important increase in IQ's. Yet, if the doctrine of formal discipline were true, if the study of certain subjects improved memory, reasoning, power of concentration and so on, then the IQ's of the students concerned would increase, because intelligence is based on such functions as memory and reasoning. These considerations would seem to make it necessary to reject either the doctrine of formal discipline or the idea that the IQ level is in general approximately constant.

As a matter of actual fact, formal discipline has been rejected, but mainly for other reasons. In the first place, psychological analysis and investigation led to the rejection of the faculty psychology on which the disciplinary idea was based. We no longer think of the intellect as a single unit, nor of the memory, or of other similar functions, as single units. Memory is complex; there are a number of different kinds of memory; and most individuals have a better memory for some kinds of material than for others. From these facts it is a short step to the conclusion that not only are different kinds of memory specific but that memory training tends to be specific in its effects. If there is no single memory faculty to be trained, then obviously memory in general cannot be improved by any particular kind of training. We may learn better *methods* of memorizing and we may use these with different materials and perhaps get better results in that way, but this is not the same thing as improving the memory itself.

Laboratory experiments on learning and on reasoning have tended to overthrow the old idea of formal discipline and have substituted instead a new idea which we call "transfer of training." This idea, simply stated, is that learning does not improve the mind in any general sense but that the things learned may influence the learner's later adjustments. To take a simple case: a girl in school

when we wish to know the distance for a given time we simply apply the formula and get the particular answer desired. In the same way, we might remember that the circumference of a circle is 3.1416 times the diameter. We could then use this generalization in determining how many times a bicycle wheel would revolve in going a mile.

There is no doubt that, when they are clearly applicable, generalizations offer greater possibilities of transfer than could be secured by learning particular facts. Most psychologists will agree with Judd that, as far as practicable, we should endeavor to teach students to understand generalizations and to apply them. But unless we stretch the concept of generalization rather far we should note that there are some important limits to the possibility of such transfer.

There are many particular facts that must be learned as particular facts. The reader has learned to recognize A, B, C, D, E, F and 1, 2, 3, 4, 5, 6. These and most of the symbols for concepts in our vocabularies must be learned without much help from generalization. So must thousands of other things.

In the next place, the application of generalizations requires intelligence of a sufficiently high level. Transfer is not at all automatic. Each individual must see the relation of the appropriate generalization to each situation to which it is possibly applicable. Generalizations also vary in degrees of simplicity and in relatedness to a situation. The more difficult the generalization and the more remote the relationship, the greater the intelligence required to see the connection, and the more remote and the more difficult the connection the longer it is likely to take an intelligent person to grasp the relation. This means in turn that if the intelligent person is not sufficiently interested to continue to work with and think about the problem for a considerable period of time he is not so likely to see the connection. For this reason the transfer of generalizations depends on the difficulty of the generalizations, on the closeness of the relationship, and on intelligence, interest, and perseverance.

Since there is no guarantee that the different members of a class will see the relation of a principle to a particular situation simply as a result of teaching the principle, it is frequently advisable in planning a curriculum to make special provisions for application of principles taught. This is regularly done, for example, in teachers' colleges by requiring student teachers to take work in practice teaching. In such training courses they are supposed to apply under supervision the principles they have learned in the theory courses. In the same way internes in medicine spend a year or two working under the supervision of experienced physicians before they go out to practice independently. Surveying can be taught in a classroom, but in large measure it must be learned in the field. In general, it is true that if we are to obtain a broad transfer of generalizations we must make special provisions for this in planning the curriculum.

Since intelligence increases with age, and since there is little capacity for understanding and applying abstract generalizations before the age of twelve years, it follows that the possibilities of transfer through generalization will be quite limited before that time. As far as the elementary school period is concerned, transfer will tend to be limited very largely to a transfer of more specific elements.

There have been some conspicuous examples of failure to obtain transfer by teaching generalizations. One of the most notable instances is found in the teaching of formal grammar. At the beginning of the present century, in many schools, a course in grammar was given in the eighth grade, and much formal language training was given in the earlier grades. The assumption was that, if pupils learned the rules to be followed in speaking and writing correctly, these rules would be applied, and errors in English would be eliminated or greatly reduced as a result. In practice this assumption was not found to be true. Grammatical generalizations did not transfer to any great extent to actual speaking and writing. When this fact was appreciated, the formal grammatical training in the elementary school was largely eliminated.

A related example is found in the teaching of morals. Hartshorne and May found on their tests of moral behavior that attendance at

Sunday school had little effect on performance. Children who were registered as belonging to a Sunday-school class did better than those who were not so registered, but attendance seemed to have little effect. This indicated that social atmosphere, meaning the influence of family and associates during the week, had much more influence than the learning of generalizations about moral conduct. In this connection, it would probably be difficult to show that moral behavior is any better in European countries where ethics and religion have been taught in the schools than it is in the United States where such teaching has not been common.

The most general application to the curriculum from the experimental study of transfer is that the curricular content should be selected so that it will function as directly as possible in life situations and that when generalizations are learned they should be applied to numerous practical problems so that their applications will be well understood.

It should also be noted that transfer is not always positive. Some early learning interferes with later learning, and some later learning reacts upon and weakens earlier learning. Some golf teachers say that baseball players are likely to find the development of a good golf swing more difficult because it differs from the swing of a bat. Also, a golf player who tries to learn a new swing may find that for a time his game is worse because the learning of the new swing interferes with his learning of the old one. In the same way inaccurate ideas may interfere with later learning.

Capacity for Learning.—One of the most important factors in learning is capacity as represented by scores on tests of intelligence. Figure 10 shows that the average child with a mental age of seven years is able to learn to read successfully, whereas the average child with a mental age of five years is not ready and is not likely to make normal progress. Children with a mental age of twelve years can learn to understand abstract words such as justice, pity, and envy, but children with lower mental ages are likely to have great difficulty in grasping such concepts. The ability to formulate and to apply abstract general principles tends to come toward the end

of mental growth and then only in those individuals with better than average IQ's.

The pre-school child learns a great deal, but his span of attention and memory is short and what he learns is limited mostly to the concrete and the particular. His capacity to understand is quite limited and he requires more repetition in order to establish associations.

During the elementary school years from six to twelve, there is a progressive increase in the span of attention and of memory, and there is a corresponding increase in capacity for understanding. Before the age of nine or ten years, according to Binet test standards, the average child sees nothing foolish in the statement, "Yesterday the police found the body of a girl cut into eighteen pieces. They believe that she killed herself." One youngster's reaction was sim-

ply, "She sure had some nerve!" At about ten years of age, however, the average child has reached the stage in his mental development at which such absurdities can be understood. At about the age of eleven or twelve years, a child is able to interpret an ordinary picture, but before that age the description given is likely to be limited mostly to a statement of what is taking place.

During the period from twelve years to about twenty years, the growth and maturation of intelligence is completed. Capacity for abstraction and generalization reaches its highest level, for mental maturation is completed at about the age of twenty years. The final level reached will depend, however, on the relative brightness or

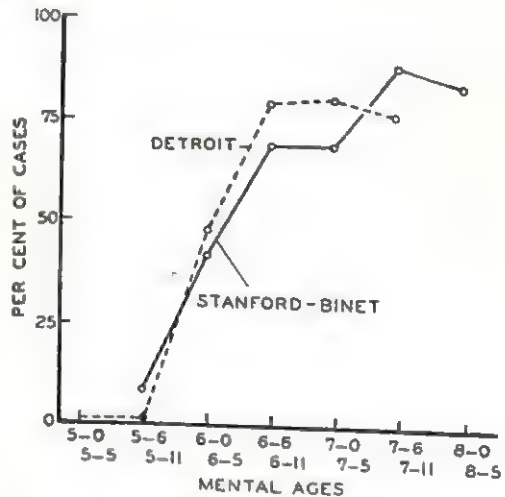


FIG. 10.—Percentage of pupils who make satisfactory reading progress in relation to mental age on the Detroit Test (broken line) and on the Stanford-Binet (solid line). Morphet, M. V., and Washburne, C. When should children begin to read? *Elem. Sch. J.*, 1931, 31, 496-503. By Courtesy of the University of Chicago Press.

on the IQ of the individual. Only those with high IQ's will ever reach the point at which they have great capacity for dealing with abstractions.

The chief differences between the young child and the superior adult may be summarized somewhat as follows:

The young child

understands the concrete
understands the particular
understands the simple
has a short memory span
perceives and thinks slowly
uses rote memory
imitates
requires supervision
tends to overt reactions
uses sensory observation

The superior adult

understands the abstract
understands the general rule
understands the complex
has a longer memory span
perceives and thinks quickly
uses rational memory
is more original
can use freedom wisely
reacts more mentally
uses more reasoning

It is also important to recall, as was pointed out in Chapter 2, that at each chronological age level there is a wide range in mental ages. At the age of 12 years the standard deviation of the Stanford-Binet Test is about 20 IQ points,²⁰ (p. 40). On this basis the middle 90 per cent of a normal group of 12-year-old children would range in mental ages from about 8 to 16 years. Similar though less extreme variations are likely to be found in school achievement.

It has also been pointed out that a single individual may vary greatly in the strength of different capacities. In specialized capacities this variation in some individuals is likely to be almost as great as the variation in single capacities in a group of individuals. A child may be excellent in arithmetic and poor in reading, or vice versa. It is obvious that these variations greatly complicate the problem of the curriculum maker and of the teacher as well.

Experience and Learning.—Perception and learning generally involve the interpretation of the new in terms of what has already been learned. The student must learn and retain plane geometry if he is to succeed in solid geometry. He must be proficient in algebra before he can learn calculus. He needs a good vocabulary

before he attempts to learn to read. For this reason it is essential that a curriculum be planned so that a proper foundation will be laid for what is to follow. Instead of beginning to teach reading immediately in the first grade, for example, it will very often be more profitable to give children experiences that will enlarge their vocabularies and make their concepts more accurate. When this has been done, the process of learning to read is reduced largely to learning to associate printed symbols with already established concepts. It is for this reason that illiterate adults may be able to learn to read a newspaper in a surprisingly short period of time.

Forgetting.—Anything that is learned tends to be forgotten unless it is used, while anything that is used frequently tends to be retained indefinitely. Forgetting is influenced by a number of factors. Among the more important of these are the thoroughness with which the material has been learned, the length of time it has been retained or practiced, the extent to which the content is meaningful, the physiological retentiveness of the individual concerned, and interference from other learning.

If something is memorized simply to the point of one perfect recall, it tends very soon to drop below the point at which it can be recalled. If, however, practice is continued beyond the point of recall, the material will be retained better and can be recalled after a longer period of time. This fact is important to the curriculum builder because it means that he cannot expect anything that is learned to be retained very long unless it is learned thoroughly. And even then it must be used, in school or out, from time to time or it will tend to be forgotten.

Thorough learning usually involves an important time factor. According to Jost's law, if two associations are of equal strength but of unequal age, the older one is the more permanent. If, for example, we learned a poem a year ago and have forgotten it so that we cannot recall it, and if we relearn it now to the point of perfect recall, and at the same time we learn a new poem to the point of perfect recall, a year from now we should be able to relearn the first poem in less time than would be required for the second one.

Much time has been virtually wasted in the past because facts or associations were learned but were not used afterward either in school or out, and, consequently, they were soon forgotten. This was especially true in such subjects as history, geography, and spelling. As a matter of fact, so much material was presented that it would have been impossible to review it adequately in the time available.

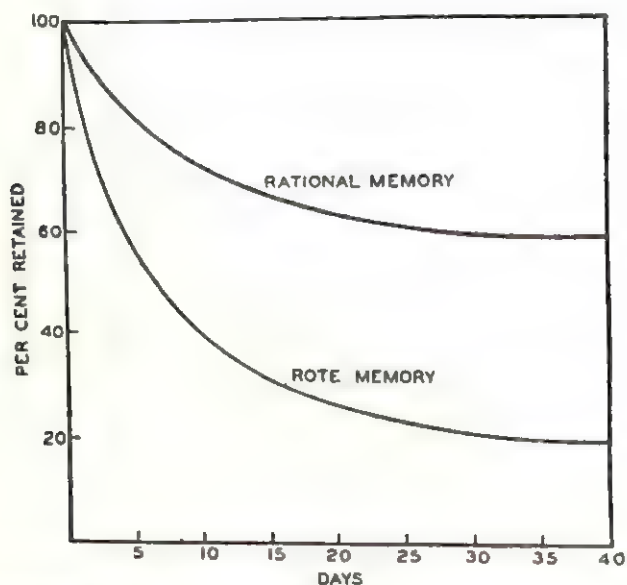


FIG. 11.—Generalized curves of forgetting for rote and for rational memory materials. The less meaningful and significant the material the more rapidly it is forgotten.

Facts and experiences that are significant and meaningful to the individual are much better retained than those that lack meaning. Material that is thoroughly understood is retained much longer than material that is learned by rote memory.

Forgetting tends to be most rapid immediately after learning, but the rate of forgetting decreases with time. The more meaningful the material, the slower the rate of forgetting. This has been generalized in Figure 11, which shows two hypothetical forgetting curves: one is for relatively meaningless associations, such as nonsense syllables; and the second is for more meaningful material, such

as a poem. For the most significant learning the rate of forgetting is very slow, whereas for associations that almost completely lack meaning or interest, the forgetting is very rapid, with the result that after a few days it will require about as long to relearn the material as was required originally.

College botany requires the learning of a great many technical terms which must be learned largely by rote memory and this material is consequently relatively easy to forget. It should, therefore, be not too surprising to find that in an actual experimental determination, it was found that about 75 per cent of the material that was known at the end of a course was forgotten in 22 months. The forgetting curve that was found in this case is shown in Figure 12.

This principle has often been sinned against in curriculum building. Children have used rote memory to learn many things which they did not understand.

Frequently they were able to do this and pass the required tests, but, after a short time, much of their learning was gone. As an example, one study¹⁰ showed that in one year an elementary algebra class forgot two-thirds of what they knew at the end of the course. Algebra is about the most abstract and difficult subject in the high school curriculum, and, as a result, relatively few students really understand it. In most instances, furthermore, they make little use of algebra after they finish the algebra course and consequently they soon forget.

There are great individual differences in memory capacity which probably depend on physiological differences. Because of these

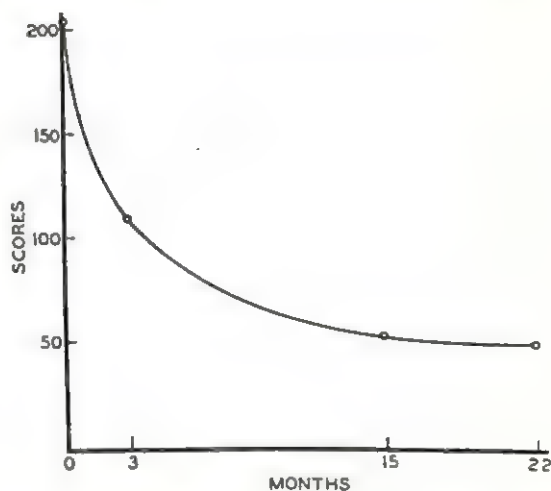


FIG. 12.—Forgetting of college botany. This was determined by testing equivalent groups after 3 months, 15 months, and 22 months. From Johnson (17).

differences, special provisions will need to be made both in planning the curriculum and in teaching so that those who forget most easily may at least have a good opportunity to learn the fundamentals of the topics they study.

One of the interpretations of forgetting is that it is due, in part at least, to interference from other learning. This interference is especially likely to occur when too many different kinds of material are learned in a short period of time, or when two closely related but different subjects are learned together. A strong argument could be made to support the statement that the curriculum includes too much for the average student, and that he would learn more if we attempted to teach him less. Experimental proof of this conclusion is lacking, but the writer happened to attend an elementary school which had only half-day sessions through the sixth grade. Yet, when he transferred to another school on a full-day basis, he had the impression that his previous training had been superior.

Interference as a result of the study of closely related but different subjects has been recognized by some schools in that they have not permitted students to begin two foreign languages at the same time. The student should have a good foundation in one language before he begins another one.

Whatever the reasons, however, actual measurements show that much of what is learned under present conditions is soon forgotten to such an extent that it cannot be used until relearned. This is a most important point for the curriculum maker to consider.

The Motivation of Learning.—The modern theory of transfer of training has tended to produce one revolution in educational thinking, and the modern theory of the relation of interests to learning is in process of producing another revolution. Emphasis on interest as a factor in learning is a logical outgrowth of the biological movement in psychology and education. The child study movement has been concerned with the development of the whole child, including physical development, emotional development, and personality development, as well as intellectual development. This emphasis has been further reinforced by the mental hygiene movement.

Although our psychology of motivation is far from crystallized, it is fairly generally agreed that emotions and feelings are very important in motivating voluntary behavior. More particularly, it has been found that our feelings in the form of attitudes, interests, and aspirations have a vital relationship to learning. Furthermore, it has been found that we learn more readily and effectively when we have the gratification provided by knowledge of reasonable success in our efforts. This prospect not only promotes better learning but results in better mental hygiene of the individuals concerned.

These and related ideas are largely responsible for the progressive education movement with its emphasis on projects and activities.

The importance of interests in connection with learning is based on the fact that mental activity is dominated by interests. We think about the things that interest us, and, conversely, when things do not interest us, we do not pay attention to them and they readily drop out of consciousness. It is, however, necessary to recognize the fact that we have both direct and indirect interests. Our interest in food is a direct interest, but our interest in money is an indirect interest: we like to have money for what it will buy and not because we care for the paper or metal in itself. On the same basis, a student may not be interested in school marks directly but may be interested in them for other reasons. The girl who falls in love with a man who is a good student may improve in scholarship without increasing appreciably her love for knowledge.

Concentration is closely related to interest. When we are vitally interested in something we ordinarily have no difficulty in concentrating on it. The student who cannot concentrate on his school assignments is usually more interested in something else. Success in learning is closely related to degree of concentration.

Effective learning requires assimilation; for this reason material must be understood by relating it to past experience or by applying it to life situations and problems. Furthermore, assimilation usually requires thoughtful reflection. When we are interested in anything we think about it, we read about it, we talk to other people about it. When we are not interested, we think about other things that do

interest us. For this reason we are not likely to assimilate anything that does not concern us either directly or indirectly.

Since it has been recognized that learning is so definitely conditioned by pupil interest, an effort has been made to modify the curriculum by eliminating material that seemed to be too far removed from the interests of the pupils and by including material which they found interesting. In order that this might be done more effectively, numerous studies have been made of children's interests. As a background for further discussion we shall outline the results of some of these studies.

Zimmer²⁹ describes a method of using children's questions as a basis of work at the first grade level. At any time a child may ask a question about something he would like to know. These questions are not immediately answered but are recorded for future use. Thus the teacher is given the opportunity to look up material if necessary and to organize material more effectively. This method has much to commend it, but a less "progressively" minded individual might raise the question as to whether better results would not be secured if systematic studies of interests at each grade level were made and more systematic programs planned to answer these questions that normally arise. The method described by Zimmer obviously leaves a great deal to the chance curiosity of individual pupils and to the originality and resourcefulness of the teacher (cf. 11, 13).

Boynton⁴ made a study of the wishes of elementary school children and found that they particularly liked such things as bicycles and automobiles. There were some sex differences in that boys were more interested in ponies while girls were more interested in clothes. City children had more interest in social problems than rural children.

Such studies can be used in curriculum building in that reading material can be related to bicycles, ponies, and clothes. Problems in arithmetic, similarly, can be based on situations that might arise in connection with these interests. Even if formal instruction is given in arithmetic as a subject, it will be much more interesting

if the problems are stated in terms of things that the child understands and in which he is interested.

Hockett and Forry,¹⁴ on the basis of a study of the reading interests expressed by pupils in grades three to seven, report that boys are especially interested in games, sports, hobbies, and handicrafts but that girls are more interested in jumping rope, playing house, collecting dolls and doll costumes, and in caring for a baby. This study indicates that there may be some difficulty in catering fully to the interests of the sexes in mixed groups.

Shakespeare²⁴ reports more interest in bodily activities at the lower grades. At about age eleven there is an interest in recognizable achievement, and at about age twelve there is evidence of interest in utility.

Sands²³ studied the fifth and sixth grade levels and found the children to be interested in the following: physical activities in the form of sports, games, hikes, and excursions; physically creative activities such as the use of their hands in construction; adventure in books; and the dramatic as presented in movies and plays.

Bell³ studied the unanswered questions of upper grade pupils and found that at the fifth and sixth grade levels the frequency of these unanswered questions, in order of importance, was as follows: (1) nature and the physical world, (2) science and mechanics, (3) family, animals, and school life, (4) other people, (5) personal affairs, (6) politics, and general information, (7) vocations, and (8) religion, marriage, and sex.

At the ninth and tenth grade levels, the order of importance was as follows: (1) personal affairs, other people, (2) religion, politics, (3) family, (4) marriage, sex, vocations, (5) science and mechanics, (6) school life, (7) nature and the physical world, and general information.

This study indicates a very definite shift in interest from a greater curiosity about the objective world of science and mechanics at the fifth grade level to a greater interest in personal and social affairs at the ninth and tenth grades. Evidently we should not expect social science as social science to be very popular at the elementary school level.

Baisden and Burkhard¹ had pupils in the first six grades list the best-liked and the least-liked of eleven elementary school subjects. The results for the sixth grade are shown in Table 3. This

TABLE 3. BEST- AND LEAST-LIKED SUBJECTS IN THE SIXTH GRADE
(BAIDEN AND BURKHARD, 1)

<i>Best-Liked</i>	<i>Per Cent</i>	<i>Least-Liked</i>	<i>Per Cent</i>
Arithmetic	22.1	Penmanship	13.8
Art	16.1	Music	13.6
Library	13.3	Science	12.1
Phys. Ed.	12.6	Spelling	11.6
Music	12.1	Arithmetic	9.9
Science	9.8	Soc.Stud.	9.7
Soc. Stud.	4.6	Art	7.1
Spelling	3.7	Language	7.0
Reading	3.1	Phys. Ed.	6.5
Language7	Reading	6.4
Penmanship5	Library	2.0

shows the percentage of the total group who listed each subject as most or least liked.

This study shows that some subjects shift position greatly as children advance through the grades. Reading is best liked in the first two grades but drops to ninth position in the sixth grade. Arithmetic starts in sixth position in the first grade and rises to first position in the sixth grade. Social studies start at the bottom of the list of best-liked subjects and gradually climb to seventh place in grade six. Language has the poorest total showing among the best-liked subjects. Art makes the best showing on total score as the best-liked subject.

Some of the best-liked subjects are also among the least liked. Arithmetic and music are near the top in both lists. This is probably due to the fact that these subjects involve special abilities which differ greatly in children. Those children who have difficulty with a subject, such as arithmetic or music, are much less likely to

like it. Social studies rank near the bottom of the list both as best liked and as least liked. Library work is the least offensive of all subjects and ranks fifth as a best-liked subject.

The reasons given for disliking subjects were as follows:

1. Uninteresting course or materials	38%
2. Lack of ability or aptitude	36%
3. Method of teaching	15%
4. No value	6%
5. Teacher	5%

These results show that interesting content is of primary importance in causing students to like a course, and that ability to succeed in the work expected is of about equal importance. In other words, it is essential that work be of a suitable level of difficulty. In the ordinary class if the requirements are the same for all and are suited to the average student, the best students may be bored because the work is too easy while the poorest students may be dissatisfied because they find the work too hard.

By the time the eighth grade is reached, interest in physical activity has declined, and children are more interested in the radio, in movies, in comic strips, and in reading. Satisfaction in mental activity is replacing satisfaction in physical activity, although there is still considerable interest in the latter, and this interest is likely to be relatively greater in children of less intelligence.

At the secondary school level, Pritchard²² finds that students like self-activity in preference to having the teacher do all the talking; they like to prove things, they like discussion, and argument, they like variety, they desire things linked up to life, and they like material to have "human interest." This preference is in agreement with the general idea that learning should be active rather than passive and that the material presented should be significant.

Symonds²⁵ found that young adolescents are most interested in money, personal attractiveness, study habits, personal and moral qualities, and a philosophy of life. They are least interested in sex, safety, civic interests, mental hygiene, and daily schedules.

Johnson¹⁶ investigated the reading interests of children from grade five through grade eleven as indicated by shifts in the parts of newspapers read. There was no important change in interest in the comic section—most children read that—but with increasing age more mature interests are indicated by an increased amount of

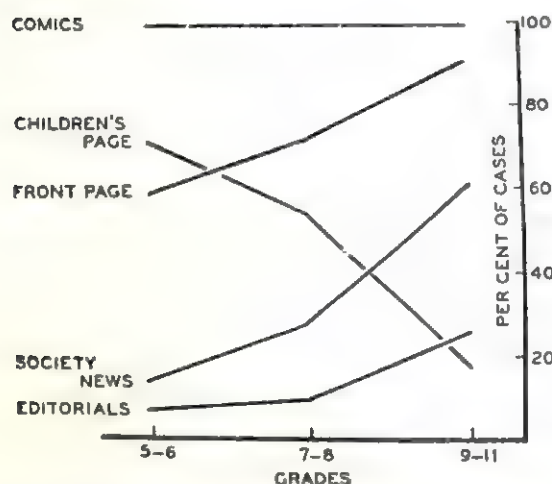


FIG. 13.—The percentages of girls at different grade levels who usually read different sections of a newspaper. From Johnson (16). By Courtesy of the University of Chicago Press.

attention to the front page and to the editorial page and, in the case of girls, to the society news. Some of the changes found for girls are shown in Figure 13.

From these disconnected results it is possible to get a somewhat more connected idea of the growth of interests. The young child is interested in the concrete and the particular and preferably in things that move. Static things have less appeal. Hence animals are more interesting than stationary

ones. People are interesting at first not as personalities but because they move and do things. Dolls are more interesting if the eyes close when the doll "lies down."

Interest in nature, the physical world, and mechanics, especially at the concrete level, comes before there is much interest in people or in social or civic affairs. For a long time the conventional elementary schools missed a most important opportunity to teach nature study and elementary science. The only "scientific" material in the elementary school early in the present century was a course in geography and one in physiology and hygiene. The geography was a mass of facts and statistics and gave relatively little understanding. The physiology and hygiene was usually rather remote

from the interests of childhood. Today we are still quite backward in most schools in work in elementary science.

In early adolescence, interest in personal relations becomes greater and adolescents begin to think more about personal achievement and success. Possible vocations are considered more seriously. Educational and vocational guidance become more important because high school courses begin to differentiate.

Moral conduct, altruism, and interest in religion become significant in adolescence. There is some evidence that altruism reaches a high point at about sixteen or seventeen and then declines somewhat.

Interest in civic affairs appears to depend very largely on social stimulation. Specifically a large proportion of college students in this country show little or no interest in politics.

SOME APPLICATIONS

It would take several volumes to survey adequately the possible applications of psychological facts and principles to the content and organization of the curriculum. Obviously then the most that we can hope to do here is to introduce the student to the subject.

Maturational Level and Learning.—When the same material is taught at different grade levels it is usually found that the percentage of children who achieve a satisfactory degree of mastery increases from grade to grade. Courtis⁷ has shown this, for example, in the spelling of the word "transfer." His results are shown in Figure 14. Few if any children below the second grade can spell the word, but nearly all children beyond the ninth grade learn to spell it. Figure 15, from Pflieger,²¹ shows similar results for achievement in reading as measured by the Iowa and by the Stanford reading tests. The principle represented by these graphs has been expressed in general form in Figure 16. Under given instructional conditions, and for any given item or unit of instruction, there will be a level below which the results will be close to zero, but if the material is not too difficult, it will be found that above some matu-

rational level nearly all children will achieve satisfactory mastery. On this basis we may accordingly agree on some arbitrary stand-

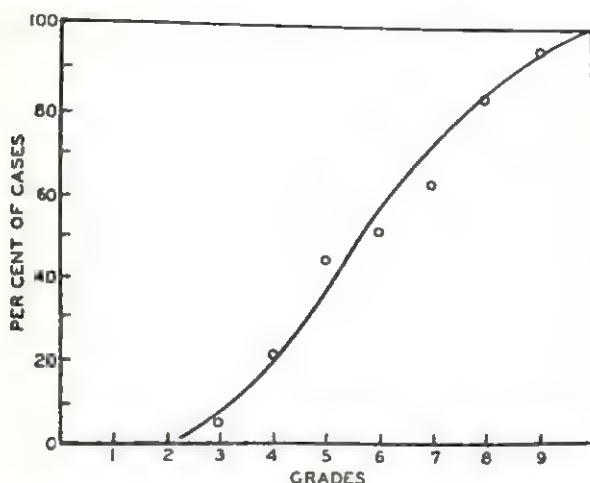


FIG. 14.—Increase in ability to spell the word "transfer." From Curtis (7). By Courtesy of the National Society for the Study of Education.

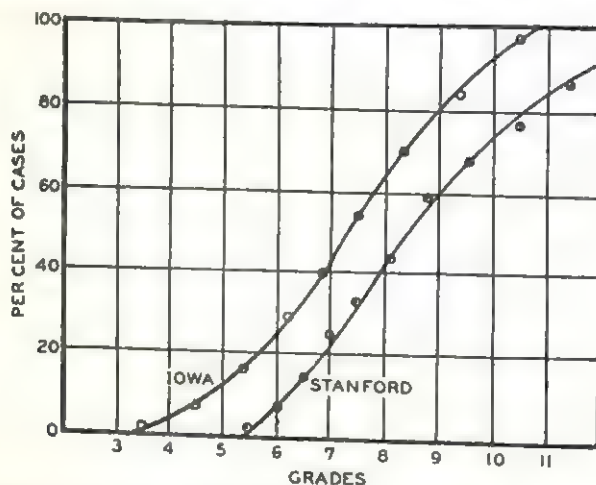


FIG. 15.—Percentages of students scoring at or below various grade levels on the Iowa and the Stanford Reading Tests. "This chart is to be read: 2% of the students scored at or below the 3.5 grade level on the Iowa test; 7% scored at or below the 4.5 grade level; other points on both curves are to be read the same way." From Pfeiffer (21, p. 544). The Stanford and Iowa tests were administered at the grade levels of 8.6 and 8.9, respectively.

ard of acceptable mastery, such as getting satisfactory learning from 75 per cent of the pupils, and we may then determine experimen-

tally the grade level at which this is achieved. This is indicated on the figure by the arrow. This material should be taught at or above the grade level indicated by "X." If it is placed at a lower grade level we shall either have to spend more time teaching it or else we should normally expect a lower percentage of children to achieve satisfactory learning.

It must be understood, of course, that previous learning is also important in determining success in learning at any given maturation-

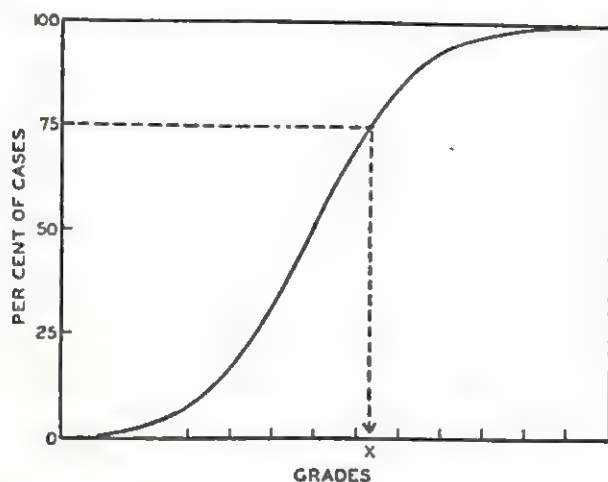


FIG. 16.—A generalized curve to show the theoretical relationship between maturation and success in learning. If mastery is required for 75 per cent of the pupils under given conditions, the material should be taught at or later than the point indicated by X on the chart.

tional level. Achievement at higher grade levels will usually depend on mastery of content at lower grade levels, but, at the same time, maturational level does seem to be an important determiner of success in learning.

Reading.—Success in reading requires both adequate background and a suitable level of maturation. This implies that throughout the educational program from the kindergarten through the university it is essential that the curriculum include experiences and activities which will afford a suitable basis for the development of concepts and vocabulary. This is most important in the early grades because the average child's experiences have been very lim-

ited, but the principle holds for adults who are exploring new areas. University students of psychology need to observe actual cases of manic-depressive insanity and of paranoia if these terms are to have much meaning. It is generally recognized, of course, that medical students need to see different diseases and to observe surgical operations. Educators have for centuries emphasized the fact that the schools are too much given to verbalism; but the criticism is still a valid one. If, then, reading is to be taught effectively, the curriculum must be planned so that the appropriate concepts and vocabulary will be mastered as a foundation for learning the actual mechanics of reading.

It has already been noted that a mental age of about 6.5 or 7 years is needed for normal progress in learning to read. Some reading can be taught below this mental level, but, on the whole, it would be more useful, if practicable, to use the time in developing a more adequate background in children of lower mental ages.

The content of the readers should naturally be mostly in terms of vocabulary that is already known. It is also desirable, of course, that the content deal with material that is either actually or potentially of interest to the children concerned.

The determination of the actual content of the reading program should be settled experimentally. Different materials should be tried and tested for comprehension and interest. Without such tests no teacher or psychologist can be sure as to the actual suitability of a given selection for a particular group. Because of the wide variations in capacity and in interest in a given class, it is desirable that a variety of reading materials be available as soon as there is any possibility of individual variation in the reading that is done.

Spelling.—The most important consideration in selecting a spelling vocabulary is that the words be used in the writing done by the pupils. On the basis of a number of extensive studies of this problem there are now available several lists of the most frequently used words. These words have also been classified as to difficulty so that they can be distributed at different grade levels.

If not more than 3,000 words are included in the spelling list to be taught in the first six grades, it will normally be necessary to teach not more than three new words daily, and this number can be taught rather successfully to most pupils, but if a much larger number is attempted, the results will generally be unsatisfactory.

Arithmetic.—The traditional arithmetic of a generation ago consisted mainly of training in computation and in the solution of problems. Contemporary training in arithmetic, in contrast, aims to give a broader understanding of the social functions of arithmetic and of quantitative thinking in general. Before actually teaching particular types of computation, it attempts through projects or otherwise to develop an understanding of the use of these processes. This broader understanding of arithmetic has been called social arithmetic while the training in actual arithmetical operations has been called computational arithmetic,⁶ (p. 276).

Training in social arithmetic can be accomplished through group projects and may be more flexible than training in computation. For best results in the latter case, considerable attention to individual needs will be necessary.

The exact grade placement of the content in computational arithmetic should be determined experimentally. Students of mental growth can describe the nature of the psychological changes that occur from birth to maturity, but they are not able to deduce from these facts the age at which the average child will succeed in mastering a given bit of content.

Figure 17 shows the kind of facts that may be obtained by an experimental attack. Let us assume that we have decided to place the different arithmetical operations at the grade level at which 75 per cent of the pupils will get a score of 75 per cent correct on a test given six weeks after the completion of instruction, the delay being used to test retention. These facts are taught to groups of children of different mental ages, being careful to use uniform methods in teaching all groups.

When the tests have been given and scored, a graph similar to that in Figure 17 can be constructed. In this case, it may be seen

that for the particular standard agreed upon, a mental age of 7 years and 7 months is indicated. This is shown by the fact that the solid line in the graph crosses the broken line at a point just above the mental age of 7 years and 7 months. This would mean that this material belongs properly in the second grade.

We may, of course, wish to set up some other set of standards. If we are satisfied with lower retention scores or if we are satisfied

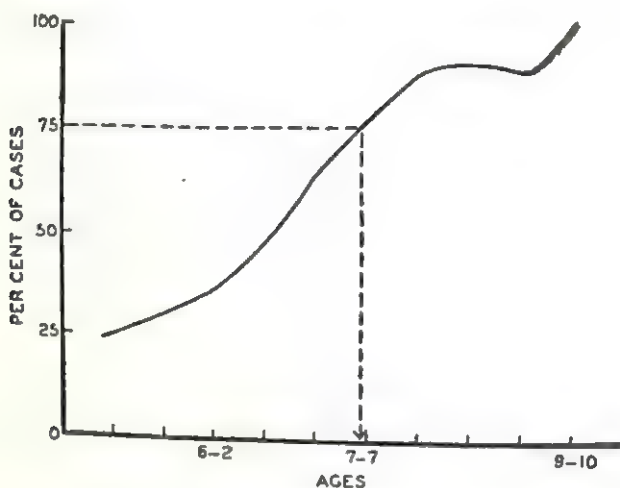


FIG. 17.—The increase in ability to do hard addition facts. This applies to sums over 10, with 75 per cent retention. If it is required that 75 per cent of the children reach this standard, this is achieved at about 7 years and 7 months as indicated by the dotted line. From Washburne (27, p. 303). By Courtesy of the National Society for the Study of Education.

to have a lower percentage of the group reach this standard, or possibly, if we are willing to devote more time to instructing these facts, we may be satisfied with the results secured at lower mental ages. If, however, we raise our standards, it will be more satisfactory to postpone the instruction to a later mental age.

On the basis of such studies the content of the arithmetic work has been rather well worked out for the different mental ages. To illustrate this I shall quote part of a more detailed outline from Washburne,²⁷ (pp. 309 ff).*

* By permission of the National Society for the Study of Education.

DATA AND RECOMMENDATIONS FOR PLACEMENT
MENTAL AGE 6-7

While children of this mental age can learn the addition facts with sums of 10 and under and the easy subtraction facts, there is much doubt whether systematic instruction in arithmetic should begin so early. Even these two elements are better learned a year later. Experimental evidence is beginning to accumulate to indicate that this year, and possibly the next, should be devoted largely to informal experience and activities to give children real concepts of numbers and space relations, without any systematic drills.

MENTAL AGE 7-8

The addition facts with sums of 10 and under are well learned at this level, and there is little gain in further postponement. The harder addition facts and the easy subtraction facts can be successfully learned at this age, but there is a definite gain in postponing them to the next level.

.

Simple comparisons of length, height, thickness, width, and the like, including the recognition that one object is two, three, or four times as high, wide, long, thick, or deep as another, are well learned.

.

Children can learn to read the clock on the even hour, to distinguish between morning and afternoon, and to understand the symbols A.M. and P.M.

MENTAL AGE 8-9

The elements assigned to the previous level can be postponed to this level with advantage. Children can also learn the more difficult subtraction facts, although there is some gain in postponing these another year. They can learn to subtract three-digit numbers from three-digit numbers as far as the handling of the mechanics is concerned, but there is reasonable ground for doubt whether such numbers have any real meaning for them.

The easy multiplication facts can be taught at this level very effectively. Multiplication facts fall, with a few exceptions, into two categories, those with products of 20 and less, and those with products of more than 20. The former belong definitely at this level; the latter about three years later.

MENTAL AGE 9-10

Column addition with columns not more than three digits high and three digits wide can be learned at this level as far as accuracy of computation is concerned. Question may legitimately be raised as to the meaning and use of such columns at this level, but research on the point is lacking.

It is probable that simple multiplication involving no partial products over 20 should be introduced at this level.

.

The meaning of simple fractions of a whole object definitely belongs at this level. Children can learn to recognize and distinguish half of an object, a third, a fourth, three-fourths, and so forth.

MENTAL AGE 10-11

Column addition four digits high and three digits wide can be done accurately at this mental age. Children can understand the meaning of simple decimals and can learn to add and subtract them.

.

The addition and subtraction of fractions and mixed numbers with like denominators, if confined to the ones commonly used in life, can be successfully learned at this level.

.

In time measure, children can now complete the table of time from seconds up to leap years, including days in a year and weeks in a year. They can learn to read clocks accurately to the minute and to express time accurately to the minute in the form "10:22 P.M."

MENTAL AGE 11-12

Multiplication facts with products over 20 are not adequately learned at a mental age of 10 years, 9 months; only 56 per cent of the children of this mental age make scores of 76 per cent or more, even when they have an adequate foundation of addition facts.

.

Either before or after the learning of simple and compound multiplication, as soon as children know all the multiplication facts, they readily learn the division facts. Shortly thereafter they are

reasonably successful with short division, although there is a gain in postponing this until the next level.

Long division with a two-place divisor and a one-place quotient is successfully learned at this level by children who know their multiplication and division facts. . . .

. . . .

This is the level at which square measure as a regular topic can be best introduced in its simpler form. . . . They can calculate the number of square feet or inches in a given area when the dimensions are given in even feet or inches.

MENTAL AGE 12-13

Long division with a two-place quotient involving noughts, remainder, and trial divisor difficulties probably belongs at this level.

. . . .

The meaning of fractions of a group of objects belongs here, such as the recognition that three objects is a third of nine objects. Following this, children can learn the multiplication and division of fractions satisfactorily.

MENTAL AGE 13-14

Long division with a three-place quotient, with or without the difficulties of noughts, remainders, and trial divisors, but still using a two-place divisor, is not taught successfully before this level. This is true whether tests are graded in terms of accuracy or in terms of correct process, disregarding mechanical errors.

. . . .

In linear measure, children can learn to divide feet and inches by a whole number when both feet and inches are evenly divisible, and to divide yards by inches, making the necessary change in denomination. . . .

. . . .

In square measure children can learn to draw rectangles of a given number of square inches with varying bases given, such as drawing a 4-square-inch rectangle 2 inches wide. As a matter of fact, this particular problem can be learned at the level below, but when the problem involves a fraction, such as a base one-half inch wide, it is better learned at the level above.

MENTAL AGE 14-15

The usual textbook problems in addition and subtraction of unlike fractions involving the finding of common denominators and, in case of the subtraction of mixed numbers, involving borrowing are not successfully learned below a mental age of 14.

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The familiar schoolroom problems of finding the number of square yards of linoleum needed to cover a floor, the dimensions of which are given in feet, is not successfully learned until this level.

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In time measure, as in linear measure, children can solve problems involving the fundamental operations applied to hours and minutes, and involving changes of denomination. Some of these problems, however, are apparently too difficult even at this mental age.

In this connection it is worth while to recall that in the Stanford-Binet Test there are three arithmetic problems at the mental age level of 15 years, which is supposed to be reached at the chronological age of 16 years. One of these problems is: "If a yard of cloth costs 15 cents, how much will 7 feet of cloth cost?" In order to pass the test two of the three problems must be worked without paper or pencil within a time allowance of one minute for each problem.

The fact that the test was placed at the mental age level of 15 years indicates that children of lower mental ages did not solve two of the three problems correctly within the time limit allowed. Harder problems could of course be solved by using paper and pencil and with a longer time allowance.

This will indicate the way in which the content of arithmetic may be adjusted to the mental level of the learner. For further details the reader should consult the original article and other more recent studies

From this survey of arithmetic, it should be evident that the common practice of introducing algebra at about 14 years is psychologically questionable. Judd's position that geometry is more concrete and can be understood earlier than algebra seems to be psychologically sound. In order to settle this matter, however, we need

extensive experimentation with algebra, geometry, and trigonometry to learn the results secured by introducing them at different mental age levels.

Commercial arithmetic has often been taught at about the eighth grade level, and the results have been rather generally unsatisfactory. Better results could unquestionably be secured by postponing the subject to the twelfth grade. Mental maturity at that level would be greater, the social significance of commercial arithmetic could be much better understood, and there would be less time for students to forget the material before they had an opportunity to use it in actual business operations. And probably relatively few who drop out of school before the twelfth grade will have a great deal of use for commercial arithmetic in any case.

Social Science.—During the past generation or two, educators have quite naturally been concerned with social and governmental problems, and they have equally naturally hoped to help solve these problems through school instruction. As a result a great deal of "social science" has been introduced into the schools. In social science, however, as well as in the other subject areas we confront the same problems with respect to adapting the curricular content to the maturational level, to the experience, and to the interests of the pupils.

After reviewing the research studies in this area Jersild,¹⁵ (p. 106) comments as follows:

Various lines of evidence bear on this problem. Many findings based on studies of children in formal school situations as well as in "progressive" schools indicate that schools have either (a) failed to discover and apply effective teaching techniques or (b) tended to push children too soon into subject matter and ideas relating to adult political, economic, and social affairs.

Jersild notes that in one study at the sixth grade level one-third or fewer of the children understood the meaning of such terms as "government," "tariff," and "secretary."

Social science readings usually involve abstract terms that are not understood much before the twelve year level, if they are under-

stood then. For this reason, social science below the level of the senior high school is likely to prove disappointing.

Jersild further points out that when material is not understood, the result is likely to be indoctrination. Children memorize statements and accept them as articles of faith rather than as ideas that are rationally understood. Hitler, and many other leaders, have, of course, made a great deal of use of this kind of indoctrination, but it is hardly the kind of instruction that many American educators will desire.

Many facts can be memorized at all grade levels, but at the present time there is considerable room for doubt as to just how well we are succeeding in our attempts to teach social science before mental growth is nearly complete; and, until we have more exact and reliable information on this point, it will not be possible to outline with confidence a social science curriculum for the public schools.

Foreign Languages.—In the United States, foreign languages are usually begun either in high school or in college. They are frequently considered difficult subjects even at these levels. Yet, in ancient Athens the imbeciles must have spoken fairly good Greek even when they were very young. Certainly Roman children must have been talking fairly good Latin at the age of two or three. From this we may infer that, if a language is learned by natural methods, it can be spoken very early, and it can be read fairly well by the mental age of eight or nine years. If there were any need, therefore, for learning to speak or read foreign languages early, they could be included in the elementary school curriculum, and in some cases this has been done successfully.

It seems clear that the pronunciation of a language is best learned in childhood. Foreigners who have come to this country as adults rarely speak without an accent.

When languages are taught by grammatical methods, however, college students generally make more rapid progress than is made by students of lower levels of capacity. Consequently, if a foreign language is not to be used until college or later, and if pronunciation is

not of primary importance, study of the language may well be delayed until it is likely to be needed. This will result in less forgetting.

In the planning of a foreign language curriculum there will be problems, of course, similar to those encountered in the teaching of reading. The reading content should be adapted to the maturational level and interests of the students involved.

OTHER PROBLEMS

Survey Courses.—Psychology theory has often been used to support survey courses as introductions to general fields of study, and many survey courses are now offered in high school and college. For those who wish a general knowledge of a broad field such as physical science but do not have the time to take separate courses in physics, chemistry, geology, and astronomy the survey course may prove very desirable. It may also be helpful for the student who wishes to locate more exactly both his interests and his special capabilities.

Other questions arise that cannot be answered with assurance. Should survey courses be given both in high school and in college? If so, what is the proper relationship between them? If a student is rather certain that he wishes to specialize in a particular field, should he be required to take the survey course as an introduction? Possibly at some future time we may have some experimental data on which to base answers to these questions, but at present we have little more than conflicting opinions.

Adjustments to Individual Differences.—Because of wide individual differences in needs, in interests, and in capacities, no one standardized curriculum will be adequate for all even below the level of professional and vocational training. A three-track curriculum for the slow, the average, and the bright is one answer, but it is not a complete answer because of the degree of specialization of abilities and interests. In many cases it will prove more effective to organize temporary small groups within a larger class and to vary

assignments to suit their needs. In other cases individual work can be arranged. In colleges and in graduate schools, for example, this may be done in honors programs and in research projects. In elementary schools reading assignments may often be different and individual projects may be given.

Beyond the elementary school level we generally find some provision for elective courses. With proper guidance, this system may make it possible to make adjustments to individual differences. Many educators have felt, however, that the elective system has often resulted in a neglect of essentials by too many students, and, as a result of this feeling, there has been a tendency in recent years to impose more requirements, particularly in colleges of liberal arts.

When courses are required, it will often be found that students lack interest and perhaps also capacity for successful work. In such cases the net effect may be unfavorable. On the other hand, very often it may be quite true that students do not have sufficient knowledge about their own needs and capabilities and potential interests to make wise selections. Probably no one system will be best all of the time for all students. On the whole, it is probably best to have considerable flexibility in requirements and at the same time to have the best guidance that can be provided.

QUESTIONS AND EXERCISES

1. How does psychology influence educational aims? Give at least two specific illustrations.
2. How was the theory of formal discipline related to faculty psychology?
3. What is the modern theory of transfer of training?
4. Explain Judd's theory of transfer through generalization. What are some of its limitations?
5. How has the content of the spelling course been determined in order to secure maximum transfer?
6. What are the psychological merits of survey courses?
7. How does a knowledge of maturation influence the organization of the curriculum?
8. Suggest some desirable changes in the organization of the high school mathematics curriculum and give reasons.
9. Why is social science a difficult subject below the college level?

10. If reading is not taught in the first grade, what training will be most effective in preparing children for learning to read in later grades?
11. Why do adults learn to read more easily than children?
12. What are some of the provisions that curriculum makers may make for individual differences?
13. What are the actual transfer values to be expected from a course in Latin? How will this vary for different individuals?
14. How should the psychological facts about forgetting influence the content and organization of the curriculum?
15. How should our knowledge about interests be used in constructing the curriculum?

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CHAPTER 4

EXTRACURRICULAR ACTIVITIES

For several decades extracurricular activities have been receiving an increasing amount of recognition. At first the tendency of conservative schoolmen was to be unfavorable to any great amount of student activity outside of the regular curriculum. In part, this attitude was probably due to the fact that the term "extracurricular activities" was rather generally understood to refer to intercollegiate sports, and especially to football. In the early days football players were hired rather openly, and, in some of the more extreme cases, they did not pretend to attend classes and do regular academic work. Or, when they did attend classes, they contributed nothing to them. When attempts were made to raise standards, and players were required to have passing grades in order to play on the teams, faculty members were at times put under pressure to supply the necessary grades regardless of the actual scholastic performances of the players. This situation naturally did not increase the popularity of extracurricular activities with the more academically minded instructors.

But athletes have not been the only students who have neglected regular courses because of taking part in activities. Students participating in debates, in dramatic productions, in journalistic enterprises, such as the college or high school annuals, and in glee club trips have also received unfavorable attention because of absences from regular classes and neglect of work. In some of these cases students have devoted considerably more time to their outside activities than they have devoted to their courses. And some students have added insult to injury by saying very frankly that they considered their activities to be of greater educational value than their regular curricular registrations.

In spite of the prejudice—some of which was fully justified—against extracurricular activities, they have increased greatly in number and in student participation and have come to be recognized by educators as important contributors to a complete education. They have spread downward from the college level until now many elementary schools give special attention to furthering such activities.¹ In fact, in the activity programs of the Progressive Education movement, the extracurricular activities have been incorporated into the curriculum. This can be done easily in the early grades and is done to some degree in high school and college but is less likely to be done above the elementary school level.

The recent more favorable emphasis on the educational importance of extracurricular activities is in a general way the outgrowth of the recognition that education should apply to the whole person and should not be limited simply to intellectual training. More specifically, there are a number of reasons for supporting a properly conducted program of activities. We shall consider a number of the more important of these.

1. *Physical Exercise.* Children and adults have bodies as well as intellects, and these bodies require exercise for proper growth, development, and functional efficiency. In one study,⁷ health and physical fitness are quite properly listed as one of ten of the imperative needs of youth of secondary school age. Napoleon's dictum that an army fights on its stomach applies equally as well to the intellectual field. Philosophers think on their stomachs. If their digestive mechanism does not work properly, they will not be capable of prolonged creative mental work. For this reason we need more rather than less emphasis on regular physical activity for all children and adults. This emphasis is the more necessary under present conditions because urban life and automobile and bus transportation largely take away the necessity for physical activity.

2. *Relaxation and Recreation.* Work needs to be balanced by play. Contemporary living tends to be characterized by excessive neuromuscular tension. An increasing number of people are suffering nervous and mental breakdowns, and, as Jacobson¹² has very

effectively pointed out, relaxation is one of the most essential requirements of both physical and mental hygiene. Sports, games, hikes, excursions, and other activities help to meet this need. They arouse interest and enthusiasm not possible in the performance of calisthenics and similar exercises. This reason alone is sufficient justification for promoting sports for all students at all ages. It is also a reason for raising serious questions as to the value of much of our present program of intercollegiate sports. These tend to reach such a high level of competitive intensity that they are of very doubtful value for the relaxation of the players involved.

3. *Emotional Expression.* Normal development and activity requires emotional experience as well as intellectual experience. Yet most school work is primarily intellectual. If the school does not provide some approved outlet for emotions, some other outlet will be found, and it may not be of a type that will win adult approval. Juvenile delinquency results in part from the failure to provide normal and desirable outlets for juvenile drives. When this has been clearly recognized by educators, and by social and civic leaders, the problem has been met in part by the providing of public playgrounds and social centers, and this remedy has worked effectively.

Emotional training requires varied opportunities for emotional expression, and these cannot be provided very well in the conventional subject curriculum. For this reason the extracurricular activities are a necessary part of a well-rounded educational program.

Actual test ² shows that participation in extracurricular activities is correlated with scores on the Bell Adjustment Inventory: the students who take part in such activities are better adjusted than those who do not; but the cause and effect relationship here is not entirely clear. It may be that a large part of the correlation is due to selection. At the same time, it seems reasonable that such participation would improve physical, social, and emotional adjustment.

(4. *Social Training.* Extracurricular activities are necessary for social training. Some social training may be given and is given in

connection with regular academic work, but there is a need for much more extensive social participation and training than can well be given in regular courses. Some of our most brilliant students are socially backward. There is actually very little relation between success in the classroom and general social adjustment.

(In view of our present conception of transfer of training, we must conclude that, if boys and girls are to become well adjusted socially, they must do so by successfully participating in social activities. They must have the experience of giving and of accepting invitations, of making introductions, of carrying on interesting conversations, of playing games at parties, and of dancing properly. Social poise and confidence come from successful experience in social activities: they do not come from making high grades in English and in social science.

(5. *Personality Development.*) Personality is very complex and includes about all the characteristics that influence other people. It also involves the organization and integration of these characteristics into a unified whole.

(Most people consider the development of a good personality to be more important than intellectual training. Certainly personality is of the greatest consequence in determining social adjustments and happiness. Since the regular curriculum does not offer sufficient opportunity for expression of personality traits, the extracurricular program is necessary to provide for this aspect of education.

(6. *Democracy.* Modern education has emphasized the development of democracy. This includes the development of democratic ideals and attitudes, and, on the practical side, it includes learning from experience how to make democracy work.) However, it is one thing to subscribe in theory to the tenet that democracy is a good thing: it is quite another thing to be democratic in practice and to learn how to secure intelligent democratic group action.

(We cannot produce effective citizens of a democracy simply by teaching the theory of social science: there must be correlation of theory and practice. Extracurricular activities, including especially student government, offers an opportunity for students to learn

through practical experience something about working together. Hence those who favor democratic training, and also accept the modern psychology of learning, will be disposed to consider a good activities program a necessary part of the total educational program.^{3,5,14 23}

There is a major conflict in connection with democratic government which it is well to face honestly and explicitly. If efficiency in execution is the primary goal, autocratic government may well at times be preferable. But history seems to show that autocrats are usually concerned primarily with the welfare and glory of the autocrats. Consequently, if we are to be concerned with general human welfare it would seem that government will need to have a broader base. There is also the question as to the kind of citizens we are trying to produce. If we plan to produce citizens with the mentality and the attitudes of serfs, autocratic government is to be recommended; but if we hope to produce responsible, intelligent and civically minded citizens, it is necessary to give appropriate experience.

Amateurs and beginners commonly bungle what they do: that is characteristic of those who are learning all activities. It is, therefore, to be expected that students will make errors in their attempts to learn democracy, and patience with such errors will be as necessary for those who supervise student activities as patience with errors in mathematics is necessary for the mathematics teachers.

(7. *Artistic Training and Expression.* Extracurricular activities may offer excellent opportunities for experiences in connection with music and dramatic art, both as performer and as observer.) Glee clubs, bands, orchestras, dramatic clubs and related organizations have long been popular with students and they give excellent training. Students may take part in assembly programs and may give special performances. In some cases they take trips, and some of these may be on an exchange basis with other schools. Students who do not take part as performers may receive valuable training in appreciation by attending concerts and dramatic performances.

In the future, music and art should receive a greater degree of attention from the American public than they have received in the past, and for that reason the schools should give more training along those lines. Part of this will be curricular, but part will continue to be extracurricular.

8. *Guidance and Special Training.* Experience in extracurricular activities may have considerable value in connection with guidance. Experiences in journalism, dramatics, music, debating, athletics, student government, and other activities will often enable students to learn more about their own abilities and interests, and this knowledge will enable them to select more intelligently their courses and vocations. Without relevant experience, students cannot know accurately either their real interests or their abilities, and consequently actual experience brings surprises. Interest and talent appear when they were not suspected, and, in other cases, actual experience shows that previously assumed interest and ability are lacking.

9. *Moral Training.* Probably most educators would agree that moral training is one of the imperative needs of youth.⁷ However, researches have indicated that moral behavior is rather specific: a person may do the right thing in one situation and do the wrong thing in another situation. General rules of ethical conduct do not transfer effectively to conduct in general. For this reason it is necessary to develop correct habits of behavior in a variety of situations before there is a reasonable expectation that conduct will generally be what it should be. Ordinary classroom work cannot offer these varied opportunities for correct behavior, but extracurricular activities do offer a considerable variety of situations and, consequently, they may be a means of valuable moral training. Conversely, if extracurricular activities are not properly conducted, their effect may be definitely bad. In some cases intercollegiate athletics have been conducted in a way that was definitely detrimental morally to the participants. Victory at any price, rather than sportsmanship, has been emphasized. In part this has resulted from the fact that the

coach's salary depended on the success of his teams. But in any case, we cannot give effective moral training without involving students in situations with real moral problems, and the activities program offers these situations to a much greater degree than is possible in the regular curriculum. However, if the activities program is to afford the best moral training it is evident that adequate and proper supervision will be necessary. This implies that teachers must be given special training for such work and must also be given such duties as a part of their regular teaching schedule rather than as an extra chore added to an already full schedule.

(10. *Specialized Interests.* Students with special interests, curricular or otherwise, frequently form clubs to promote these interests. Clubs, such as chemistry clubs, foreign language clubs, and others, tend to reinforce the regular curriculum. Others, such as photography clubs, may involve applications of principles learned in regular courses. The educational advantages of such clubs are fairly obvious.)

(11. *Training for Leisure Activities.* Training in the proper use of leisure time has been listed as one of the imperative needs of youth.⁷) In another study,⁴ in which high school graduates appraised extracurricular activities, it was found that they wanted more experience in those things that they were likely to do as adults. This includes such things as swimming, cards, skating, current affairs, dancing, and various avocations.

Although this category obviously overlaps several of those already mentioned, (it seems worth while to point out specifically that extracurricular activities are closely related to many of the things that people do as leisure activities.) Modern industrial developments are resulting in an increased amount of leisure time for most people so that they need to learn how to keep themselves occupied in interesting and worth-while activities. If they do not develop interest in such activities, they will be reduced to the necessity of depending on the radio or on the movies to avoid boredom. This may be one of the most important aspects of the experience with various activities.

PSYCHOLOGICAL PRINCIPLES

Since extracurricular activities cover such a wide range of performances, most of the facts and principles of psychology have at least an indirect relation, but there are a few principles that deserve special mention.

Much psychological research has indicated a rather high degree of specificity of capacities and of the results of learning. When we practice a particular thing we usually become more proficient in doing that, but there is no guarantee that this proficiency will have any important effect on other activities even though they seem to be closely related. This involves the question of transfer of training discussed in the last chapter. If we would be proficient in public speaking, we must practice public speaking: we do not gain such proficiency by studying prose composition or geometry or piano or painting. Generally a large amount of transfer occurs only when activities are very similar. Consequently, when we consider that our activities in life are exceedingly varied, it is evident that if we are to be trained for these different performances the training must itself be varied. This is one of the chief psychological supports for an extensive program of extracurricular activities.

In an earlier chapter the general nature of individual differences has been outlined. Such differences are found in the characteristics involved in extracurricular activities. Extensive variations are found both in the capacity for and in the interest in sports, in social affairs, dramatics, and other activities. In addition to this, there is the further complication that people like to be successful in their activities, and, as a result, they are likely to avoid doing things in which they are inferior—and especially when their inferior performance is likely to be noticed unfavorably by others. Because of these factors, if there is no regulation of the degree of participation in activities, some students will devote the major part of their time to them while others will tend to avoid them. Generally it will be the least proficient individuals who will devote the least time to such activities, while those who are already most proficient and consequently least in need of improvement may engage in extracur-

ricular activities to such an extent that their regular school work suffers. This creates an important educational problem. Is it, for example, wise to permit the socially incompetent and shy individuals to avoid participating in social activities? As a matter of fact, some college men and women have gone through four years of college in a coeducational school with practically no social life that involved members of the opposite sex.

Another psychological factor which deserves special mention in connection with activities is motivation. We have noted the importance of motivation in connection with learning. In general the efficiency of learning is closely correlated with the strength of the desire to learn. Since student interest in activities is usually very great, the learning in activity programs is likely to be more efficient than much of the learning in the regular curricular program. Many students who have very little academic interest will work with concentration and efficiency to put on a play or to put out an excellent school annual. In some of these things they may learn a great deal that is of value. Furthermore, some at least of the motivation derived from the extracurricular activities may be expected to transfer to the curriculum. Then there are the more dubious cases of the athletes who are in school almost solely because they wish to participate in athletics but who are forced by the regulations to show at least a semblance of academic achievement. This may not be the ideal type of motivation but it does work to the extent that these men acquire more of an intellectual education than they otherwise would. On the other hand, some students become so interested in an activities program that they tend to lose interest in the curriculum.

Opponents of extracurricular activities have often charged that the activities detract from study. As stated above, this is undoubtedly true in some cases. It is also true—and very often true at that—that excessive attention to particular courses causes students to neglect other courses, but this is hardly a sufficient argument to justify limiting the curriculum to one subject at a time. In general the statistical studies show that the brighter students and the students who get the best grades also take more part in the extracurricular

program. There are, however, many exceptions. Some "grinds" get high grades but avoid the activities program; other individuals give so much time and attention to the activities that they do not get grades high enough to stay in school. This indicates the need for more attention to the problem of regulating the distribution of student time, but we cannot reasonably expect all students to be models in this respect.

At times it is reported that athletes and other special groups get lower grades than the average student, which is not surprising. Many athletes go to college primarily to take part in athletics. They are selected for athletic ability rather than for scholastic ability, and since the correlation between athletic ability and scholastic ability is quite low, it is to be expected that such a group will be below the general academic average. In the second place, when so much emphasis is placed on turning out winning teams, and when teams are drilled so hard in order to make them win against other teams drilled just as hard, it would be surprising if the participants had enough energy and interest left to do normal work in school. This is hardly an argument against legitimate sports, but it may be an argument against the present emphasis on turning out winning teams.

(APPLICATIONS)

(If it is accepted that extracurricular activities have the educational importance that has been indicated above, several steps may be taken in order to make these activities most profitable. The present trend seems to be in the direction of including them in the curriculum.^{8, 13} This might mean that they would be required for those who are most in need of them, and it would certainly mean that more adequate supervision would be provided. It is desirable that students continue to have a large responsibility for this program, but better supervision will be necessary if the best results are to be obtained.

In the second place, it is desirable to set aside one period for activities. This has been done in many schools. In the early grades

where much of the regular school work may be on an activity basis, this will not be necessary; but, in the later grades and in the high school, it usually is necessary in order to achieve the best results.)

(In the third place, steps need to be taken to reduce the grounds for the frequently justifiable complaint that extracurricular activities interfere too much with regular school work. This problem may be approached in two different ways. Certain activities are closely enough related to the regular curriculum that credit can justifiably be given for activities work, and in this way the regular load can be reduced so that the work can be done more nearly as it should be done. This procedure applies especially in the case of debating, dramatics, and journalism. (Preparation of debates is as distinctly intellectual and educational as most courses.) It may also take a very great amount of time. The editor of a high school or college annual must also spend much time on the job. If such an editor in high school is given one unit of credit for his work, he will have less need to neglect the three units for which he is registered. The other way of meeting this difficulty is by restricting the number of activities in which a student is permitted to engage. The editor of an annual does not need at the same time to take part in dramatics and debating.

(In some schools participation in extracurricular activities has been restricted for those with low grades. As a general policy this is to be questioned on psychological and educational grounds.) The available evidence indicates that brighter students tend, on the average, to be somewhat better adjusted socially than the poorer students. If, then, we require a certain level of academic performance before we permit participation in the activities program, we may be depriving some students of the kind of training they most need. It might in certain cases be more justifiable to require a light curricular program until the student qualified in his social and other important adjustments. These poor students will not be likely to be intellectual leaders in any case so that their success and happiness in life may well depend on the kind of training they will get in a well-conducted activities program. For the poor student, if restrictions are in order, it would seem more justifiable to restrict both

the curricular registration and the participation in activities which did not appear to be needed for his personality development.

FORMS OF EXTRACURRICULAR ACTIVITY

The Home Room.—In grade school and in high school the home room has come to be in many cases the center of the extracurricular program. A teacher may keep a group for several years and in that way become well acquainted with the characteristics of each pupil. This teacher comes to stand in loco parentis in many respects. She very largely has the responsibility for curricular, vocational, and general guidance. She has the major responsibility for teaching the students how to study and for giving them social and moral training. Home-room programs can fill in the gaps that would otherwise be left in the students' training. The home-room teacher can organize and synthesize and give direction to the whole program. One full period each week is usually recommended for home-room activities.

The Assembly.—Just as the home room is the center of the activities of the class group, the assembly is the center of activities for the entire school. The school assembly affords the opportunity for lectures and movies of general educational interest. It may be used by school groups to present anything of interest to the rest of the school, to present musical and dramatic productions by student organizations, and for meetings of the student government.

Self-consciousness is natural for those who are not accustomed to speak in public, and the only cure is experience in speaking before groups. The school assembly offers an opportunity for students who are interested in public speaking to present ideas to groups larger than classes. It is, of course, not to be expected that all students will become proficient public speakers; many will not be interested in developing such proficiency; and the assembly will not provide sufficient time for such experience for a large group, but it will provide the opportunity for those most interested.

Student Government.—One of the items that is most emphasized in current educational philosophy is the development of demo-

cratic attitudes and of proficiency in democratic government. Many educators and others believe that the only hope of avoiding future disastrous wars lies in the development of greater democracy. If we accept this goal of education, it follows that democratic attitudes and proficiency in democratic government can be gained only through actual experience with democratic processes: they cannot be gained simply by studying the history and principles of government. Theory is desirable, but practice is also important. To meet this requirement a special effort needs to be made to make all of the work of the school as democratic as is practicable.

(This program does not mean that children are to run the schools. Even in our national government, we have seen fit to provide that the executive may veto legislation and, although it is possible for the Congress to pass legislation over the executive veto, the veto does definitely curb the power of the legislative branch of the government, and many bills fail to become laws because of this possibility of veto. In one large university the president had the power of vetoing temporarily any regulation passed by the faculty. This veto permitted further study of the subject and made it necessary for the faculty to pass the proposition at a later date before it could become a university regulation. These veto powers are the result of long experience with democratic processes, and they indicate that some curbs may be needed even when the people involved are intelligent adults. It seems, therefore, rather obvious that more curbs and restrictions will be needed in case of children and adolescents.

It is especially requisite in thinking about the development of democratic government to remember that growth and development is a gradual process, and that the development of native capacities and tendencies is not complete until about the age of twenty years, but that the development of understanding based on experience may continue until senescence. For this reason the growth of democratic attitudes and of proficiency in democratic processes is like the growth of power to do mathematics. All of us must begin by learning to count and by doing simple number combinations. Some never get beyond a low level of achievement. Others reach the level of comprehension represented by creative genius. Even future

mathematicians cannot ordinarily be expected to do algebra at the age of eight years. In the same way, the development of democracy in school affairs must be a slow, gradual, and long process.

Some think of democracy as the freedom of a group to run things as they wish. But a satisfactory and effective democracy involves more than freedom. It also involves responsibility and consideration for the rights and welfare of minorities. For this reason democratic rights for school children cannot safely be given very much in excess of their willingness and ability to use these rights wisely. This implies that at first children should be given freedom to make decisions only in small matters and that freedom will be increased as maturity and responsibility increase.

One crucial point is the handling of errors: learning through errors may be expensive, but it may also be most effective. A leading baseball manager once remarked that he was always glad when one of his new players made a blunder during the training season, because such blunders would be less likely to occur later. In the same way, errors must be made in the processes of government if students are to learn most effectively. They are likely to vote for a student officer simply because they like him; but they may find out later that he does not have the qualifications for the job.

Teachers tend to be professional perfectionists, and, as a result, they may find it difficult to keep from interfering too much with student decisions, but it is necessary to permit students to do things at a level below perfection. This is one of the chief reasons for restricting freedom to capacity and responsibility. If this is done, the errors made are not likely to be very serious.

(If the teaching staff works at the task, student responsibility and capability can be increased until students assume a large part of the responsibility for the government of the school. Order and discipline may be maintained largely by student patrols and monitors. When such a system is well established, it will be more effective than faculty control because individual pupils who might be disposed to rebel at adult control will hesitate to set themselves against those of their own age.)

Student government has also been successfully extended beyond the school grounds to include traffic control near the school at street crossings. Police departments have cooperated with schools in this respect, and grade school children have served effectively to make street crossings safe for children.

Pupils in school have also participated in municipal affairs, and children are assisting in solving problems of juvenile delinquency. Youth centers are being set up under the joint sponsorship of the schools and of civic agencies. They provide recreation and keep children out of trouble, and, at the same time, they afford valuable training in democratic government.

Student government can be made to work effectively; it has been made to work effectively; but at times it has failed. When failure occurs it is usually due to the absence of competent and sympathetic supervision, and, specifically, it is likely to be due to entrusting students suddenly with too much power without proper preparation. Or it may be due to a perfectionist attitude on the part of supervising teachers which causes too much interference. If this occurs, students are likely to lose interest and refuse to cooperate.

(**Clubs.**—A great variety of student clubs can be found in our schools. Some of these are very closely related to regular course work. Examples are science clubs and foreign language clubs. Other clubs may have very little direct relation to school work. In general the members of these clubs are brought together by a community of interest. This means that club work is often rather strongly motivated, and such club work may be an important factor in curricular and vocational guidance. Members of a chemistry club are likely to be encouraged to take more work in science and to go into scientific careers.

(Other clubs cater more to artistic and recreational interests and may have more avocational value. Music clubs and dramatic clubs are likely to be in this class, although for some students these clubs give prevocational training.

Since the number of clubs in a large high school may be very great, it is probably wise to restrict the number to which any one

student may belong. This safeguard may be necessary to prevent some students from neglecting their regular work.

Clubs have great educational possibilities, but, if these are to be attained, there must be competent supervision. Supervision will pay big dividends both in improving the quality of the club work and also in giving the supervisor a better opportunity to get well acquainted with the club members. This supervision will make possible much better student guidance.

(**Publications.**—Government and the press are very closely related. If we encourage student government, we should also encourage student publications. They provide an important outlet for the expression of student opinions. They give training in collecting news and in writing and valuable business experience to the business staff. These educational values hardly need to be defended.

One serious problem in connection with student publications is censorship. This involves particularly the use of profane and obscene language and the criticism of faculty and administration. Improper language can largely be eliminated by proper appeals to student leaders and by showing them that such language is a mark of bad taste and immaturity. Criticism of faculty and administration may be a more difficult problem. There are all kinds of teachers and administrators and some of them deserve about the worst that the students can say about them. But it is usually questionable as to whether criticism in such cases would not make bad matters worse. In such cases students could probably get more of a redress of grievances by diplomatic private protests than by publicity. In such situations, intelligent and sympathetic supervision may be of great value.

Another difficulty which arises in connection with publications is that editors may spend so much time on publications that they neglect other work. Probably the most effective remedy is to give credit for the work so that the regular academic load can be reduced.

(**Debating.**—Debating has long been accepted even by academically minded educators as a desirable extracurricular activity. It

gives valuable training in public speaking, and it may lead to an intensive study of both sides of important questions.

At the collegiate level, debating occasionally consumes so much of the student's time that he neglects his other work. Here again, therefore, it would seem to be wiser to give considerable credit for debating in order that other work may be done more satisfactorily.

Honor Societies.—In high school and in college, honor societies, such as Phi Beta Kappa and Sigma Xi, have been developed as a means of giving recognition for scholarship. Some of these societies have regular meetings and may have dinners and lectures. They do encourage scholarship to some degree, but their value for motivation is necessarily limited because they can appeal to only the more able students.

(**Music and Dramatics.**—Musical and dramatic activities have long been recognized as legitimate extracurricular activities. As our culture becomes older it is to be expected that there will be an increased recognition of the importance of music and art and that they will receive more attention in the schools. Formerly students who wished to study music had to do this outside of school hours with private instructors, but now some of our more progressive schools give instruction even on instruments such as the piano as a part of the regular curriculum. There are sound educational reasons for encouraging this practice. However, even with a wider recognition of the arts in the curriculum, there will still be an important place for music and art as extracurricular activities. Individuals and groups with artistic interests will naturally fit into the assembly programs and into public meetings and will give special concerts and plays. Participation in these programs will give social training and will prepare students for desirable leisure time activities in later life.)

(**Social Activities.**—The importance of social training is now generally recognized in this country.)In the early part of the present century, however, this was frequently not the case. One preparatory school of that time permitted boys and girls to greet each other

with "Good morning" or "Good afternoon" but prohibited any conversation beyond that. No dates were allowed at any time. Girls were marched to church on Sundays in columns of two's. On rare occasions a "reception" was given at the girls' dormitory. This also was strictly regimented. The girls were seated around the wall in alternate chairs. Boys took the vacant chairs. At the end of three minutes, a bell sounded, and the line of boys shifted to the right. This regimented progression continued as the program of the evening. This was the extent of the social relations between the sexes officially permitted by this school! During this era, also, there were many "female academies" which gave even less opportunity for the young ladies to get acquainted with the opposite sex.

Times have changed; and we now generally realize that successful adult adjustments between the sexes are much more likely to result from mutual understanding based on long experience. As a result of this change in attitude, we now give boys and girls a great deal of freedom. In many high schools and colleges social affairs are left very largely to the planning and management of the students.

(Under this system those individuals who are socially inclined and gifted may have and usually do have a rather full and satisfactory social life.) But those who are less socially inclined or less gifted are very likely to miss the social experiences which fall to the others. Some boys and some girls go through college with very few if any dates. Their social life is limited almost entirely to the ordinary daily associations with their own sex. If we believe that social training is important, such a state of affairs evidently calls for some constructive changes in our handling of this phase of extracurricular activities.

(There are individual differences in social tendencies and in social capacities, just as there are individual differences in interest in and capacity for reading and arithmetic.) But although we have for some time recognized the latter differences and have made serious attempts to do something about them, we have as yet given but little indication of a realization that there is a serious problem of individual differences in the social field.

When we become sufficiently concerned about the matter we may apply to the social field some of the same general procedures that we now apply to the teaching of the regular curriculum. We have classified students on the basis of IQ or other measures of development so that those who are slow learners may receive special attention. We give achievement tests to locate special subject weaknesses, and we apply corrective treatment if the defect happens to be in reading or in arithmetic. We might do the same thing in the area of social training. It is true that we do not now have tests of personality and of social adjustment that are as valid and reliable as the tests of intelligence and of achievement; but, in spite of this lack, we could easily select some individuals who need special social training and we could see that they get it.

If we are thinking in terms of life adjustment, it is more important to locate and correct personality difficulties and difficulties in social adjustment than it is to correct shortcomings in the academic area. However, if this is to be done, social affairs will require more definite supervision and will in a sense become in some degree at least curricular.)

Definite adult supervision and control are needed to avoid some of the things that will result from unregulated student activity. If left alone, boys and girls in high school will pair off too exclusively. When a boy goes two or three times with a girl, she tends to be let alone by other boys, with the result that she must go with the one boy or not go at all. Girls frequently do not like this situation but are relatively helpless. Then at dances, both in high school and in college, it too often happens that one couple dances together for practically the entire evening. This practice could be corrected if a competent social supervisor would discuss the matter frankly with student leaders and secure their cooperation. A date bureau could be operated to introduce more variation into the pairings for social events and dances and to give the girls more freedom of choice in determining their partners. Dances could be on a program basis with emphasis on exchanging dances. When this is properly done, a boy first consults his partner to learn her wishes and then arranges a program for the evening. He should not keep more than one-

Work Experience.—High schools and colleges are now giving more attention to the desirability of students having work experience, along with their education, before they leave school and go to work on a regular basis.¹⁵ It is urged that work experience gives a better sense of reality and a more mature outlook on life and that it is excellent training for citizenship. Such work may also have considerable value in connection with educational and vocational guidance. The girl who works during the summer vacation as a florist's assistant, or as a nurse's aide, can get a much more accurate idea as to how well she would like to follow such work as a vocation. It is suggested that the schools should assume a greater degree of responsibility for assisting in locating and supervising these outside job opportunities, and, in addition, the school might do a great deal to obtain favorable working conditions for its students.

Summer Camps.—Modern school work is being integrated more with the life of the community, and one indication of this is found in the fact that schools are assuming responsibility for assisting in the development of summer programs of recreation.^{16,17} This may take the form of summer camps or it may involve the development of recreation programs within a city. Youth centers have been developed especially to provide suitable activities for the summer months. Experience shows that suitable recreation programs and facilities tend to reduce juvenile delinquency, and they also give physical development and valuable social training to those who would not become delinquent.

Evaluation of Extracurricular Activities.—In the field of achievement in the regular curriculum it is possible to measure with a fair degree of accuracy the results of instruction. But when we attempt to measure the results of our efforts to develop attitudes, interests, and personality and character traits in general, we confront the fact that we do not have valid and reliable measuring scales suitable for the purpose. There are a number of tests of attitudes and of personality traits available, and some have been used to determine the effects of participation in extracurricular activities,

but, to date, the most important source of information as to the value of extracurricular activities comes from the testimony of students and teachers who have had such experiences.

Both the participating students and the supervising teachers generally believe that the activities are of great value.^{4,6} Many good students say frankly that they think the activities are of more real value to them than the regular curriculum. However, such statements cannot be accepted at face value. Very often they mean simply that students have enjoyed the activities much more than they have enjoyed their regular courses. This is not surprising, but it does not settle the question as to total value. In part, this depends on our aims. If we think in terms of total life adjustments, it is perfectly clear that we cannot at present determine just how much the activities can contribute to making these adjustments more effective.

It has been pointed out that the students who take part freely in the activities are, in general, the student leaders, and that they are more likely to be leaders after they leave school.^{18,24} This is true, but it proves little. A similar type of argument was used in England to support a classical education. It was pointed out that the leaders in government had had classical training. Therefore, they reasoned, classical training produced leaders. However, in England, the rulers came from certain family groups, and these family groups sent their children to schools which gave classical training. In this case, it seems clear that it was the genetic and social heritage of the students that contributed mainly to their leadership, and that classical training was not the primary factor.

In the same way it may be argued that students with certain personality traits and interests are more likely to take part in the activities program and that these personality traits and interests will make these people leaders as adults. It has been found that students who take part in the activities are, on the average, of higher ability than the students who do not participate. Consequently, it would seem that we should expect the activity group to make more of a success in later life even if they did not take part in activities at school. These considerations will indicate the difficulty of arriving

at any certain and precise judgment as to the actual value of the program of extracurricular activities. However, this same situation also holds in large measure for the regular curriculum.

We do not know with any certainty or precision the total outcomes resulting from most of our courses in high school and college. We teach American history with the hope that it will assist in developing patriotism and a love of American institutions, but we do not know how far this is true. Geometry is still being taught with the aim of improving the reasoning powers of those who take it, but the best psychological evidence is that these hopes are not very well justified.

Some students who study arithmetic for several years emerge with an astonishing incapacity for doing problems in arithmetic. In the same way, it should not be surprising if certain students take part in activities without being changed greatly as a result.

On the negative side, we can be reasonably sure that many of the virtues claimed for participation in activities are overstated. Supporters of athletics claim that athletes develop various general character traits. However, the courage manifested on the athletic field is not very closely related to the courage required to go against public opinion in trying to bring about some social reform. For this reason, therefore, it is necessary to discount much that is said about the values of the extracurricular activities. Transfer to different situations is much more limited than was formerly believed.

It is also true, as Strang²⁰ has pointed out, that extracurricular activities may produce bad as well as good results. Some students do become so engrossed in the activities that they neglect their regular work. Many men have been killed and many more injured for life as a result of athletic activities. The emphasis on turning out winning teams does not tend to produce the best development of the players. Bribery is not unknown in interscholastic athletics, and gambling is common. This is hardly the atmosphere to be recommended for the best moral development.

Then, finally, not all social participation is beneficial. Much hard intellectual work is done more effectively alone, and many workers must learn to work in comparative solitude. Experiments in the

field of social psychology have shown that workers in a group are stimulated to work faster, but that they make more errors.

This fact suggests the need for caution in evaluating the social aspects of the extracurricular program.

Enthusiastic advocates of the value of the activities program are in danger of overlooking the unfavorable aspects. As things now stand, many students strongly desire to take part in activities and to secure recognition in that way, but for various reasons they do not succeed. In some cases they have physical or personality traits that prevent their acceptance by other students. But whatever the cause, failure may result in a life tragedy for them. It seems only fair, therefore, to include these cases along with those that are definitely favorable when we attempt to arrive at an evaluation of the total worth of the extracurricular activities.

On the whole, the activities program is probably of great value, but there is good reason for believing that it could be more valuable if a more definite attempt were made to provide adequate supervision and to reach those students who are most in need of such training.

QUESTIONS AND EXERCISES

1. What is the present status of extracurricular activities as compared with a generation ago? What are the reasons for this change?
2. What are the chief psychological values of the activities?
3. What bearing does the theory of transfer of training have on the activities program?
4. What arguments can be offered for making the activities program a part of the curriculum?
5. Explain the statement that under present conditions the extracurricular activities program is usually least helpful to those most in need of such help.
6. What do we need to do about individual differences in connection with extracurricular activities?
7. Why is it to be expected that college athletes will as a group tend to show relatively low academic achievement?
8. What are the psychological objections to the general pairing off of couples so that each individual has dates with only one member of the opposite sex?
9. What are the advantages of dances and other social events immediately after high school in the afternoon?

10. How may a good activities program influence potential delinquents?
11. What are some of the practical difficulties in the development of student government?
12. Explain the statement by the philosopher Fichte that the function of government is to make itself unnecessary. How does this apply to student government?
13. How may an activities program give vocational training?
14. What are the special values of summer camps?
15. How may training in special skills improve social adjustment?

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CHAPTER 5

GENERAL PRINCIPLES OF TEACHING

In order to get a general view of teaching methods and procedures now in use we shall first review briefly nine general teaching methods as outlined by Monroe and Marks.¹⁵ These are called general methods because they are supposed to be applicable to a wide variety of subjects. Special methods, on the other hand, are designed for use in narrower subject areas.

The Lecture Method.—A large part of the instruction at the college and university levels is given by means of lectures. These may vary, however, from the most formal type in which the lecturer reads from a prepared manuscript, and in which there are no questions and no comments from students, to an informal discussion in which students take a large part. In the kindergarten and in the lower grades essentially the same method is used under the name of the *telling* method.

This method may be, and frequently is, supplemented by the use of illustrative concrete materials, still pictures, movies, and demonstrations of experiments. When a class visits a factory or an institution for mental defectives, a lecture-demonstration may be an important part of the trip.

The Recitation Method.—The typical recitation method consists of questions by the teacher and answers by the pupils based on assignments in a textbook. In the past, this method has been subjected to a great deal of criticism, much of which was deserved. The most poorly trained teachers have more often used this procedure, but, it is only fair to observe, some other more modern methods might give even worse results if used by these same teachers. Also, the recitation method has been commonly used in teaching subjects which involved memorizing a great body of facts.

And here again, any method might have led to unsatisfactory results. It is quite possible, therefore, that recitation as a teaching procedure is not as black as it has been painted and that a skillful teacher might at times find it useful.

Object Teaching.—This method emphasizes the observation of concrete objects, the observations being directed by questions and comments from the teacher. As such, it is more appropriate for the kindergarten and the early grades, although some college teaching partakes in part at least of this character. In any case, it is certainly less of a general method than are some of the others.

Development Methods.—This is a modern version of the Socratic method in which the teacher by skillful questioning helps students to think through and clear up their ideas. One form, the Herbartian five formal steps, will be discussed more fully presently.

The Laboratory Method.—Laboratory work is common in the natural sciences, but, as used here, the laboratory method may be used in a wide variety of fields. Its essential features are individual work with guidance and direction from the teacher. Usually there is little home work and little recitation. It may be found either in the more traditional schools or in those that are most progressive.

Adaptations of the laboratory method are found in supervised study, which may at times be called directed study. The Dalton and the Winnetka plans are, in part at least, laboratory methods. Both plans involve a great deal of individual work, but both also involve group activities.)

The Project Method.—The essential idea of the project method is that there is a minimum of teacher guidance. It usually involves group activities, and there may be socialized recitations with a member of the group acting as chairman. It emphasizes student initiative and democracy. This method will be discussed further in connection with Progressive methods of teaching.

The Problem Method.—This is much like the project method in the actual activities engaged in and in the learning that occurs.

The essential difference is that in this case the problem is assigned by the teacher instead of being selected by the class.

Socialized Recitation.--This involves discussions similar to those by adult discussion groups. It assumes a democratic atmosphere in the classroom and a large degree of student initiative.

The Morrison Unit-Mastery Plan.--This method is intended for use in secondary schools primarily, and it emphasizes the mastery of the particular adaptations sought. Nothing short of mastery is to be considered satisfactory, and it is the task of the teacher to take such steps as may be necessary to bring about this degree of learning. The teaching plan follows a regular formula: test to determine class and individual status and needs; teach whatever is needed to further student progress; test results as a means of appraising the success of the teaching; and continue to follow this formula of *teach* and *test* until mastery is satisfactory.

AN EVALUATION OF THESE METHODS

(Monroe and Marks¹⁶ have also reviewed the experimental studies made of teaching methods and have attempted to evaluate their relative degrees of efficiency. They point out that the experimental results are often not in agreement and that, because of the complexity of the conditions involved, it has usually not been possible to control all of the important variables.) Consequently, when better—or worse—results are reported for a given teaching method, we cannot be sure that the difference has not been due to some other factor. If good teachers are enthusiastic about the possibilities of a method, and if they work hard at the task and succeed in arousing the enthusiasm of their pupils, the results may be better regardless of whether the method is essentially better or not. A less competent and enthusiastic teacher with a less attractive personality might use the same method and get very poor results. In fact, it is probably true that, in general, the teacher counts for more than the method.

With these reservations in mind, it does seem possible, however, to draw some conclusions about some of these methods. The lecture

method appears to produce good results generally at the college level and is probably somewhat better for the brighter students than for the poor students. The findings about the recitation method are inconsistent but tend to show that this method is inferior to others. The laboratory method is found to depend more than other methods on the teacher and to be better for the poorer students. The project method seems to increase interest and is generally preferred by the students. Many students, however, express a preference for experiments assigned by the teacher rather than for experiments selected by the class. The Morrison Plan does not seem to have been notably successful in achieving the student mastery at which it aims, but students at least prefer it to the recitation method.

Taken as a whole, these studies seem to show that the most effective teaching makes provision for individual differences and encourages student initiative and responsibility, but that all methods depend on the teacher.

HERBART'S FIVE FORMAL STEPS

This method seems to deserve a somewhat fuller exposition because it is the result of an attempt to make a detailed psychological analysis of instruction and learning. It is hardly to be considered a method for universal use in all subjects and at all levels of instruction, but it does emphasize some of the important features of good teaching.

This method was first outlined by Herbart in four steps, but was expanded by the McMurrays to a five-step method as follows: (1) preparation, (2) presentation of new material, (3) comparison and abstraction, (4) generalization, and (5) application.

In the first or preparatory step of instruction the effort was made to develop interest in the new lesson or project, to state the aim or objective of the lesson, and to recall or review any previous knowledge that might be expected to help in learning the new material. This first step, it may be noted, involves three psychological factors in learning: in the first place, effective learning depends on interest, so it is to be aroused; secondly, effective consciously controlled learning requires a definite goal or objective—

the student must understand clearly what he is trying to do; and thirdly, new material is learned by being linked up to what is already known—this already known material being known as the *apperceptive mass*, and the process of making the connection between the old and the new being known as *apperceiving*.

In the second step of instruction, the new material is presented. This may be done in a variety of ways. Objects may be seen, handled, and studied. Appropriate sensory experience might be gained in any field.) Music might be listened to, fruit might be eaten, or roses or less agreeable objects might be smelled. Trips may be made to observe features of geography or factories or museums or anything else of interest in connection with instruction. Moving pictures may be used. When concrete material is not used, the new material will be presented through language. Either the teacher may give a talk or lecture on the subject or may assign reading to be done.) In actual teaching, it was usually assumed that the material had already been learned, and this step consequently took the form of a recitation to test the knowledge gained by the students during the study period. However, in our thinking about teaching methods, we should distinguish clearly between what is to be done in class and what is to be done outside of class. An oral quiz on material supposed to have been learned before coming to class cannot properly be called presentation.

In the third step a further study is made of the material presented in step two. Suitable comparisons and correlations are made for the purpose of bringing out any general principles which it may be proposed to develop in the lesson. Here it is important to recognize the fact that, as used by some teachers, the method assumes that some general principle or conclusion is to be developed from every daily lesson in every subject. The purpose of this comparison and abstraction is to discover this general principle. As a matter of fact this is the method of *inductive* reasoning. It is used in less formal fashion by scientists in doing research work. A physician who wishes to discover the cause of a given disease will study and compare a number of cases to find out what they have in common that is not found in healthy people. If he finds such

differentiating characteristics he may generalize and say that the disease is caused by these factors. But, rather obviously, there are many teaching situations where such inductive generalizing is not called for. It has, for example, little place in spelling, or in writing, or in connection with the working of problems in arithmetic. It is evident, therefore, that the five formal steps are not universally applicable.)

The fourth step involves the formulation of the generalization. This would be the culmination of the process of inductive reasoning. In actual practice, the generalization would usually develop more or less gradually during the process of comparison and abstraction. Its final formulation would represent the fourth stage.

In the fifth and final stage, the newly discovered principle would be applied. Thus if through inductive study the principle has been worked out that water expands when it freezes, an application may be made to explain the bursting of water pipes in freezing weather, ice floating in water, and other phenomena.)

These applications may be brief or extensive. In the teaching of arithmetic, several days may be spent on applications of rules for working particular types of problems. For this reason, then, it is further apparent that it is quite unreasonable to expect every lesson to follow this outline even in those cases where in a general way the five-formal-step treatment is applicable. Applications of principles may very properly come at almost any time and stage of teaching. There is no sound psychological reason why applications should be left for the last few minutes of each class period.

To summarize: there are some excellent points about the Herbart-McMurray method, but it is not applicable as a whole to all teaching situations. This will be more evident as we proceed.

THE METHODS OF PROGRESSIVE EDUCATION

Perhaps the greatest contrast to the traditional assignment-recitation method of teaching is that of the Progressive education group. They object to basing instruction primarily on systematic textbooks, to the routine learning of facts, and to drill as formerly practiced.

Instead of emphasizing the training of children for future adult activities, they hold that school activities should be determined by children's immediate interests, and that they should learn through doing things rather than through learning verbal statements about things. Also they emphasize the social aspect of living rather than the individual aspect of getting knowledge.

On the basis of this philosophy, schools are transformed from lesson getting and reciting institutions to places where children engage in such group activities as they and their teachers think will be interesting and educational. Thus they may spend weeks or even months building and furnishing a sample of a house. While engaged on this project they may find it desirable to engage in reading to learn how houses are built; they may do arithmetic problems or learn new processes in arithmetic as a means of determining the cost of lumber or other materials; they may learn some things about electricity in connection with the electric wiring; and in a similar way they may learn many other things.

There are, of course, many degrees of Progressivism, and many educators who think of themselves as Progressives do not agree with other Progressives, just as many conservatives do not agree with other conservatives. However, in the more extreme cases of Progressive teaching there may be no class assignments of the conventional type; there may be no systematic study of any subject; there may be no regular class periods; there may be no drill; and there may be a minimum of long-range planning.

From the standpoint of scientific psychology, the Progressive movement and methods include both desirable and questionable features. On the positive side, we may recognize the importance of interest and motivation in learning. We may accept the idea of making education vital through starting with actual problems and through giving first-hand experience. And we may agree that education should involve the development of the child as a whole rather than simply the development of certain specialized intellectual abilities.

On the negative side, we may note that children's interests are fickle; that they are quite variable within a given group; and that

class projects are likely to be selected by children who are leaders in social aggressiveness rather than in the intellectual sphere. Children cannot very well be interested in things they do not know about, and one of the aims of education is to broaden their knowledge and the range of their interests.

Then there is the question as to how time can be used most efficiently. In this connection a statement by Buswell,² (p. 17) is relevant :

Regardless of new points of view or old points of view, cultural experience is a solid fact which cannot be brushed aside. There is no virtue in ignorance of it and nothing is to be gained by using pupils' time to try to discover a fact which can readily be found by reference to the appropriate source in a library. . . . The amount of time which is available for education is limited; discovery is an expensive method in terms of time, it is a valuable method in terms of experience. In view of the reality of the amount of time available for education, the teacher must decide when a child can afford discovery and when he must economize time by making use of the organized knowledge which is available, and has already been formulated for teaching purposes.

From this point of view, it would seem that the activity method is relatively best adapted to the early years of school training, but that more formal and verbal methods will often be more efficient at higher levels of instruction.

Instead of attempting further discussion of these methods at present it will be more profitable to turn our attention to a more detailed attack on the fundamental problems of method.

HOW DETERMINE TEACHING METHODS?

Since the aim of teaching is generally to facilitate learning and adjustment, the best teaching will be that which results in the most rapid and the most thorough learning. Teaching is not an end in itself but is a means to an end. Teaching that seems very good may, in fact, be very poor. A college professor once remarked that he could give a lecture and feel that he had done an excellent job—until he gave a test on the content of the lecture. Then he realized that the teaching had not been a success.

Our fundamental problem is: What can the teacher do to promote learning in the students? Sound teaching procedures must be based on a scientific psychology of learning. Consequently, if we are to know how to teach most effectively, we must first have a clear understanding of the learning processes involved in any particular situation; then we must do whatever is necessary in order to encourage those learning processes. There are some principles of learning and hence of teaching that need to be applied in nearly all situations. These are a true basis of general method. But learning situations differ greatly with different kinds of material and with different individuals. Consequently different teaching methods are necessary for the best results in teaching different subjects, different parts of the same subject, and in teaching the same thing to different individuals. This means that a continuing analysis of teaching situations is necessary.)

(However, because of the complexity of learning situations it is impossible on the basis of psychological analysis alone to determine with certainty the best methods of teaching. Carefully controlled experiments which show the comparative results of using different procedures are necessary as a check on the accuracy of our inferences from psychological principles.) If we start with two groups that are equal in ability at the beginning of the experiment, keep all conditions the same except for the difference in method, and measure accurately the results, then, and only then, are we able to say with any real assurance whether one procedure is better than another. This is not to say that psychological principles of learning are not important in determining how to teach; they are in fact quite necessary if we are to *understand why* some methods are better than others; they are necessary as a basis of planning intelligent experiments; they are a useful guide when experimental results are not available; but we should not assume that they make experimental checks unnecessary.

(SOME GENERAL PRINCIPLES OF TEACHING)

- Next we shall enumerate and discuss briefly some of the more important principles that need to be followed in order to make

teaching successful. A number of these principles will be discussed in greater detail in later chapters, and, for the interested reader, there are much longer and more detailed discussions in the psychological and educational literature.

1. *The teacher needs to have clear and definite aims.* Schools exist for the purpose of directing growth and development, and if the teacher does not consciously define her objectives and plan her work to achieve them, it is most unlikely that success will be attained by accident.)

Earlier generations of teachers were satisfied to define educational aims in very general terms, such as the development of character, or the improvement of the intellect, or the acquisition of a knowledge of the classics. The more recent trend, in contrast, is to define aims much more specifically. In teaching spelling in the fourth grade, for example, the aim may be stated as the development of proficiency in the spelling of those words frequently used in writing, and which are of suitable difficulty for this grade level. Or, we may be even more specific and state that the aim is to master a particular part of one of the standardized lists of commonly used words. In general it seems reasonable to assume that the more precisely we define our objectives the more likely we are to attain them.

2. *As far as is possible and practicable the aims of any particular project or assignment should be made clear to the pupils.* People in general—pupils included—like to understand what they are trying to do and why. Consciously controlled behavior is directed typically toward the attainment of certain objectives. It is difficult to get either adults or children to work hard at anything unless they believe that it is worth while. There is, then, a sound psychological reason for the Herbartian-McMurray procedure of stating the aim of the work in the first of the five formal steps of instruction. This is not less important in those cases in which we follow some other method of teaching.

It is also important that the goals and objectives that are given not be too remote. One of the marks of emotional maturity is the

ability to work steadily toward remote goals; but even in adults better results will generally be obtained when specific objectives are given that can be attained in a short period of time. In industry it has been found that long, monotonous tasks are done better when they are broken up into smaller units. Lewin, for example, has reported an important difference in the development of skill in factory workers who were first divided into two equivalent groups

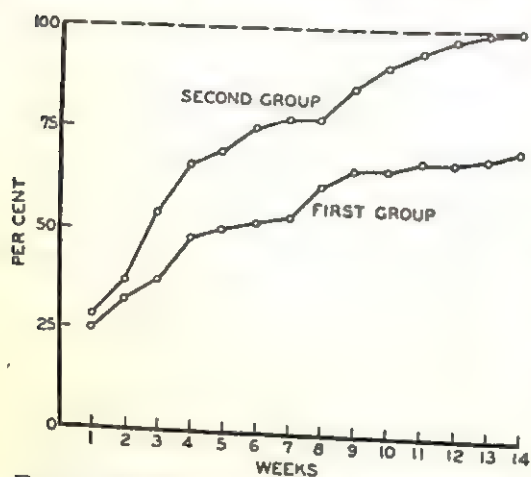


FIG. 18.—The comparative effects of a high and remote goal (first group) on the improvement of factory workers. The dotted line shows the minimum level required for rating as a skilled operator. From Lewin (14). By Courtesy of the Society for the Psychological Study of Social Issues.

and were then given different objectives. The first group was told simply the minimum level of production that they should attain in order to be classified as skilled operators. The second group was given a goal at a much lower level. This was soon reached and a new goal was assigned. This process of attaining a goal and assigning a new and somewhat higher one was continued until the desired minimum level was attained at the end of fourteen weeks. In the meantime, the first group with the remote goal had lagged far behind in their development of skill. The too remote goal had not been an effective one. The results are shown in Figure 18.

The implications of this experiment are clear: better results will usually be secured when goals and objectives are more specific and not too remote; and, furthermore, this principle is especially important when dealing with young children. At higher age and grade levels, instructional units may be larger and the attainment of objectives may appropriately be more remote.

(3. *Assignments should be in harmony with educational objectives and they should be definite and reasonable.* Teachers who

are not satisfied with the achievement of pupils will find, if they examine the matter, that in many cases the difficulty lies largely in the nature of the assignments given. When achievement is to be measured by tests, it will also be helpful to state the type of test that will be used. One of the common complaints made by students who have done poor work in a subject is that they do not know what the teacher expects.]

When mass methods of instruction are used, and when uniform assignments are made to large classes, it will frequently happen that some class members will have difficulty in achieving what is expected. If this difficulty is to be met, it will probably be necessary either to reclassify these students or to make the assignments themselves more flexible.

(4. *Teach for transfer.* A very large part, certainly, of the work we do in the schools is done for the purpose of improving adjustments to life situations. It is to be hoped that the arithmetic learned in the school will carry over to the calculation of automobile mileage on a proposed trip or to the management of a family bank account. If this transfer does not take place, the teaching has been largely ineffective. This implies, then, that the teacher is to be constantly on the alert to use materials drawn from interesting life situations. '

With a better understanding of the limitations in the way of transfer of training has come an increased emphasis on what is known as direct teaching. By this is meant the teaching of anything in the way it is to be used. An excellent example of this principle—and of a common failure to follow it—is found in the teaching of foreign languages. For ages these have been taught by having students learn grammatical rules, then attempt, by applying them, to write, read, or speak the language. Largely for this reason, foreign languages have been among the worst taught and the most useless subjects. Also, more time has been wasted in learning them than in most other subjects. In one extreme instance, a teacher of the old school met a class in German for the first time, announced the text, assigned the first 25 pages, which gave the rules for German pronunciation, warned the class that few would survive the course to the end of the year, and then dismissed them.

By the direct method, in contrast, students learn pronunciation by hearing the language spoken or read, or by listening to phonograph records or radio broadcasts. Similarly, they learn to speak or read the language by speaking it or reading it, just as a child learns to speak his native tongue. The average American child at the age of six is innocent of formal grammar or of the rules of pronunciation but is able to speak English better than most foreign language teachers can speak the language they teach. This latter fact is both a cause and an effect of existing methods of teaching. The teachers do not know the language well enough to teach by direct methods, hence they continue to use the wasteful methods of the middle ages, and so the chain of bad methods continues unbroken from generation to generation.

Another example of the principle of direct teaching may be found in handwriting. In the old copybooks of a generation ago, it was customary to have students spend much time in practicing loops and spirals, up slants and down slants. It was supposed that this would bring about great improvement in writing. Careful checks showed, however, that this assumption was not valid. The students might become quite expert in making such figures and still write very poorly when they came to write ordinary sentences. As a result of this discovery, the practice on letter elements tended to be discontinued. Direct practice on ordinary sentences gave better results. What we are aiming at in the teaching of writing is presumably to get reasonable speed and legibility in writing for ordinary use—not simply for copybook purposes. In this case, we should insist on good writing in *all* written exercises, not simply in the writing done in formal writing periods. Furthermore, this should include the leaving of correct margins and correct punctuation.

A good example of failure to use the principle of direct teaching is found in the theme paper used in our high schools and colleges. In general, we do not use ruled paper for our correspondence. Also, it is supposed to be good form to leave a margin at least on the left hand side of the paper. Probably these principles are taught in most high school English courses. But instead of having the students write on unruled paper and thus learn directly how to write in straight

lines and leave a straight margin, we have them write on ruled paper with a bold red line to remind them that a margin is to be left. It should, then, not be surprising that when plain, unruled paper is used, margins are forgotten and the general result is an unsightly paper.

The direct method of teaching usually results in an economy of time, but its chief claim to utility lies in the much greater assurance that material so learned will be used when a situation arises where the training should function. }

5. *Encourage student reactions.* It is what the student thinks, feels, and does that counts. Education is not simply a process of absorbing knowledge. Students should be encouraged to make responses and use their training.) In some practical courses, such as manual arts, this may come through making things, but in some of the more academic courses this solution is not possible. Large classes add a further difficulty because they restrict or make impossible any individual expression or question. Written tests offer a partial avenue of response and are much better than nothing. In answering a well-constructed true-false test the student may be required to show discrimination and judgment. However, such tests are necessarily limited in scope. They cannot give the student practice in enjoying good music, or in playing golf, or in working problems in algebra. Consequently, they need much supplementing if the aims of education are to be attained.

This requirement is, of course, met to a great degree in the activity programs of some of the more modern schools.) In fact, in some cases pupil activity may have been emphasized at the expense of other desirable forms of learning. In the more traditional schools, however, there is likely to be too little activity, especially in the lower grades.

6. *Develop interest in the objectives to be attained.* Common sense and experimental evidence agree that interest is one of the strongest determiners of learning.

Interests may be either direct or indirect. Most people have a direct interest in such things as food, people, beautiful scenery, and

music, while interest in such things as paper money—and school marks—is indirect. We do not ordinarily care for money, as such, but we are interested in results that can be secured by the use of money.

In general, it is more effective to appeal to interests that are direct and immediate rather than those that are indirect and remote, but it is not always possible to do this.

Interests and motives may also be classified as positive and as negative, depending on whether it is desired to secure or attain something or to avoid it. Either type of motive may be effective in determining conduct, but it is generally regarded as more desirable and more hygienic to obtain results by making positive appeals rather than by making negative ones. When it can be made to work, praise is better than censure, and rewards are better than punishment. This means that in teaching, we can usually get better results by linking school work to the positive interests of the pupils.

Hurlock¹² did one of the classic experiments in this field. Children studying arithmetic in the fourth, fifth, and sixth grades were divided into four equivalent groups. One group, used as a control, was placed in a separate room and was given the same work as the other groups but was neither praised nor blamed. The other three groups were in the same room and so could hear what happened to the others. The members of one group were individually praised for their work and were encouraged to do better; the members of another group were individually reproved for their errors; and the members of the remaining group were given the same work but received no comments on their performance, or, in other words, the quality of their work was ignored, but, as stated above, they could hear the praise and blame given to others. Under these conditions the praised group did the best work, the reproved group came next, and the control group did the poorest work. This is shown in Figure 19. It was also noted, however, that reproof was relatively more effective on boys than on girls and on the superior than on the inferior.

It is often assumed that the activity program of the progressive education movement tends automatically to solve the problem of

interest, but this is not the case. Children vary so much in their interests and in their aptitudes that no project or assignment is likely to be equally interesting or significant to all the members of a group unless the group has been formed specifically to carry out that activity.

As Morrison points out, there is a fundamental difference between developing interest in a project or topic and "making a subject interesting." Teachers may interest students and entertain them by telling them jokes and interesting anecdotes without actually develop-

ing interest in the topic under consideration; in fact such methods of making courses interesting or entertaining may divert interest away from the topic under consideration. Real interest in a subject will depend on the development of an understanding of the relationships between the subject and the student's problems and needs. The average young lady will have no difficulty in de-

veloping an interest in the use of cosmetics when she understands the relation of such preparations to her personal appearance. Students with a great deal of intellectual curiosity about the origin of man may find biological theory quite interesting, whereas students who lack such curiosity may be bored by such topics.

(7. *Encourage student initiative and responsibility.* This tends to be emphasized in activity programs, but is often minimized in traditional schools. Even in lectures, it is possible to maintain a greater degree of student activity if questions are encouraged and some student discussion is permitted. Probably it is largely for this reason that students tend to favor the discussion and the combina-

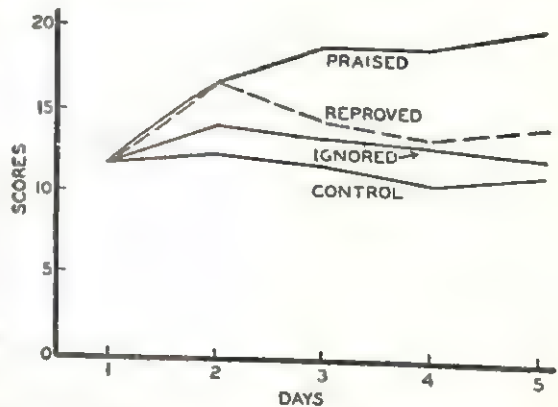


FIG. 19.—The effect of different kinds of treatment on improvement in addition. Based on four groups of children in the fourth, fifth and sixth grades. From Hurlock (12).

tion methods.⁸ When properly conducted, they tend to produce better student understanding and integration of the material covered.

(8. *Be sure that pupils have had an adequate sensory background for anything that is presented.* All learning is founded on sensory experience. Many things will be better learned and more readily learned if pictures, movies, illustrative materials, and experimental demonstrations are used. This was one of the strong points of Army instruction during World War II. In music appreciation courses, the students will need to hear a great deal of music, and, in learning to understand or to pronounce a foreign language, a great deal of ear training is necessary.

Naturally this need for sensory experience will vary greatly in different fields: in anatomy it is fundamental, while in philosophy it is of relatively little importance.

(9. *Adjust work to the achievement and capacity of the students.* This involves giving consideration both to the average level of the group and to the individual variations within the group. Inexperienced teachers are especially likely to present material at too high a level and to use a vocabulary that is too difficult. It is consequently important that suitable methods be used to determine how accurately the material is adjusted to the class level.)

The problem of making adjustments for individual differences within the class is more difficult. In a lecture to a group there is relatively little opportunity for adjustment, while in the Dalton and the Winnetka plans variation in individual assignments is a fundamental part of the system. In other cases it will be possible to divide a class into smaller groups and to vary the work in the different groups according to the differences in background and in needs. If these groupings are temporary and flexible, they may serve as an excellent means of adjusting to individual needs.

In lecture courses and in other classes with rather uniform group instruction, it is frequently possible to make variations in outside assignments which will reflect differences in both interests and in capacity. In group activities it is, of course, possible to vary the individual tasks.

In most instances of uniform group instruction it is practically necessary to make some provision for supplementary individual conferences or for conferences with small groups to clear up special difficulties. If the teacher's time is too limited to do this adequately, it may be possible to have the brighter pupils assist the slower ones.

(Individual differences in two respects deserve special mention: these are differences in sight and in hearing, and differences in rate of work.

Variations in sensory capacity are very great. Some pupils are so myopic that they cannot read a blackboard unless they are very near it and some are so deaf that they may need special attention. Such individuals should be located in all schools by routine sensory tests; the teachers should be notified of the results; and special provisions should be made to minimize the effect of the handicaps. In formal class instruction in which pupils have regular seats, it is evident that those with such sensory defects should be seated at the front of the room. Since those who are deaf often depend partly on lip-reading, it will also be helpful if the teacher will face them as far as is practicable.)

Variations in rate of work are correlated with level of ability, but the correlation is not high and, as a result, there is very wide variation in the rate of work of those who are of the same level of ability. This means that, within a given time, individuals will vary greatly both in the amount and in the quality and level of the work done. If all are to be kept busy for a fixed period of time, more work must be provided for the fast workers.

This obviously has a bearing on tests and examinations. If they are given with time limits that are relatively short, the differences in scores may depend to an undue extent on differences in rate of work.

It is, of course, to be recognized that when a teacher has too many large classes it will not be possible either to know the individual needs of different students well enough, or to give sufficient time to meeting these needs in order to give the best instruction. But, even in such situations, the skilled teacher can do a great deal to make adjustments to individuals. |

10. *For effective class work the attention of the pupils must be obtained and held.* Morrison emphasized this point at great length in dealing with the work of the high school. It is no less important in the elementary school. It is influenced by many factors. Among these may be listed the attitude of the students toward the teacher, the discipline maintained, the interest developed and maintained in the subject, the seating arrangement, the teacher's voice, and the manner in which the work is conducted. In formal classes in which students have regular seats, but in which they are permitted to choose their own seats, the better pupils tend to group near the front of the room and the less attentive ones near the back and the sides. The alert teacher can help some of those who find attention difficult by placing them near the front center of the room. Some speakers, and this includes teachers, tend unconsciously to face mostly to the right side of the room, thereby ignoring in large measure those on the other side. In contrast, the effective teacher herself gives attention to all of the group while talking to them. She directs attention particularly to those children who show signs of withdrawing their attention from the topic at hand. But the minds of children are active: they will not continue to attend to anything very long unless their interest is aroused.

11. *In taking up a new subject, first give a general view of it before studying details.* The Gestalt psychologists have emphasized the principle that the whole is more than the sum of its parts and that in order to understand anything we must get a total view of it. Certainly we have difficulties in synthesizing wholes from parts if we have had no previous experience with that particular whole, and furthermore we have difficulty in understanding parts if we have not seen them in relation to the whole.

Before Gestalt psychology was developed as a psychological school a number of educators were advocating survey courses as a means of introducing students to new fields of knowledge—these survey courses to be followed by the study of more specialized courses if the student wished such additional training. For example, it was advocated that a survey course in language be given as an introduc-

tion to the study of languages before the student began to study Latin or German or French, or that a course in general science be studied before the specialized courses in physics or zoology or geology.

This idea of making a general survey before proceeding to more detailed analysis should not be thought of as applying only to large units of knowledge or experience: it applies to smaller and smaller units as well. In anatomy one should have a general view of the body as a whole before studying the nervous system in any detail. One should have a general view of the whole nervous system before concentrating on a study of the cortex. One should have a general view of cortical functions before proceeding to a detailed study of the Betz cells and their relation to voluntary motor activity. If one would be an expert in neurocytology, which is the detailed microscopic study of nerve cells, he should have a general background in a study of cells in general.

From this point of view, the psychology textbooks of a generation ago, which began the study of the subject with a chapter on sensation or some other equally special topic, were not following a psychologically sound method. More recent texts show improvement in this direction.

As an interesting sidelight on this question, Herbert Spencer's definition of organic evolution may be adapted to the mental field as follows:

Mental development involves the integration of knowledge, with an associated reduction or elimination of confusion and error, during which the knowledge develops from a simple, unorganized vagueness to a definite, related understanding of detail, and during which the retained confusion or doubt undergoes a corresponding transformation in that it also becomes more definite.

Interpreted, this would mean that our first impressions are vague, indefinite, and generalized, but that with increased understanding our knowledge becomes definite, specialized, exact, and organized. Confusion and doubt are in large measure eliminated, but that which remains is definitely localized and specialized. The expert has his knowledge definitely organized, and likewise he has a much more precise measure of his ignorance.

The recent movements aimed at integration and fusion are in part certainly to be considered sound for the reason that they emphasize the avoidance of piecemeal and unrelated knowledge. But the first important measure to take to prevent the learning of unintegrated knowledge is to begin with a general view, then by analysis to single out the parts in their relation to the whole. In short, it is much easier to understand an automobile as a whole by seeing it as a whole in the first place before analyzing it or taking it apart than it would be to start with a pile of separated parts and endeavor *mentally* to construct a view of the whole.

The importance of this principle is being recognized in the rapid increase in survey courses at both the high school and college levels: it deserves further recognition in dealing with the smaller units of knowledge. It is an accepted principle that intelligence is concerned especially with the understanding of relationships: this then is one way in which teaching can be made more intelligent.

12. One topic should ordinarily be developed so that it leads naturally to the next. This principle follows from some of those already presented and is known as the consecutive development of knowledge or other functions. In some subjects there is a logical order of development that must be followed for clearness. In such cases the teacher may have no particular difficulty, but in other cases there may be no logical order, and in cases where there is a logical order it may not be the natural psychological order. Mathematics or statistical methods might be taken as examples of courses with a more or less logical and necessary order. Psychology, in contrast, seems to have no order of topics that is either logically or psychologically easy to grasp—if we may judge from the confusion which exists in current textbooks for introductory courses in the subject. Yet in any subject, if we are to build up complex concepts, it seems necessary that we do it in a series of gradual and orderly steps.) It may at times be difficult to say with confidence what order of treatment is best, but there can be little doubt that some arrangements are more effective than others. In this and in many similar cases, the problem should be solved by trying a given

procedure experimentally and measuring or otherwise appraising the results secured.

13. *Good teaching requires the use of the Herbartian principle of the apperceptive mass: new material must be linked up to existing knowledge to be understood.* In other words, we must proceed from the known to the unknown. To apply this effectively requires that we first determine with some accuracy what is known. In the case of large and heterogeneous classes this is likely to present in some cases a difficult problem. Some students may know a great deal about a subject and others may know very little. If the class group is to be kept together this means that it is necessary first to teach the necessary foundation material that is known to some but not to all. If this is not done, only the few will be likely to develop a good understanding of the new material.

14. *Work for clearness in the minds of all students.* This may seem an unnecessary principle, but it is of fundamental importance. Yet, in spite of its fundamental character, it is very rarely attained to the degree that would seem desirable. In ordinary classes teachers are likely to set their standards on the performances of the better than average students. When this is done, the pace is likely to be too fast for ordinary and inferior students with the result that they do not understand very clearly what is going on. Their understanding is likely to be both vague and erroneous.

One of the greatest enemies of clearness is the use of language that is not understood. This may be simply because the vocabulary is not known, or it may be because the statements are too complex or too abstract. We have already restated Herbert Spencer's formulation of the principle of evolution. Let us consider it as originally stated:

"Evolution is an integration of matter with concomitant dissipation of motion, during which the matter passes from an indefinite, incoherent homogeneity to a definite, coherent, heterogeneity, and during which the retained motion undergoes a parallel transformation."

The average college student who has not had special training in biology is unlikely to get much understanding from reading this statement. It does not link up to his past experiences, but he may, if he is industrious, memorize the words and try to get by on that basis. In such a case, if his verbal memory happens to slip a bit, he may hand the instructor some gem like the one from the psychology student who was trying to say something about the semicircular canals of the ear but referred to them as "the alimentary canal floating around in the head." Such empty verbalism is naturally not a desirable educational attainment.

Under present conditions of mass education the practice is often found of making assignments, giving objective tests on the work assigned, then continuing with more assignments and more tests on the new material without being sure that any material is ever well understood by the average student. In later chapters procedures will be presented for correcting this condition.

(15. *Thoroughness is a much needed but greatly neglected aspect of instruction.* Two different principles of the modern psychology of learning emphasize the importance of thoroughness in education. These are the principles of transfer of training and of forgetting. With a recognition of the fact that training is of value only in proportion as it transfers to life situations and that transfer is not automatic but depends on the person's ability to recall and use what he has learned, it becomes evident that material which is not well learned is not likely to be used effectively when conditions arise where it could be used if mastered. The study of forgetting has shown furthermore that, unless material is overlearned, that is, learned beyond the point of perfect recall, it is ordinarily soon forgotten so that it cannot be recalled accurately without assistance. Thus even if material could be transferred to a situation just after the learning has taken place, it is quite likely to be forgotten so that at a later date recall and use would not be possible—unless it has been overlearned.

This is one of the major points of difference between the more conservative and the more progressive educators. The conserva-

tives have overemphasized drill without due regard to other important aspects of learning while the more extreme progressives have objected to drill and have depended almost entirely on incidental learning.

If we view the matter realistically it would seem that expertness and high proficiency in any line must be gained at the cost of hard and prolonged work which goes much beyond the point of ordinary interest. It is more interesting to play golf or to play the violin than it is to practice, but the individual who would be expert at either activity must continue to spend long hours in relatively monotonous work which must involve, along with other things, the perfecting of the mechanical details of performance.

One of the chief reasons for the lack of thoroughness in our schools is that we attempt too much. Pupils are often required to study too many subjects, and these subjects are filled with too many nonessentials. Most teachers were probably better than average students themselves and had more than average interest in school work; they are consequently not able to understand the difficulties of less interested and less gifted students and they tend to expect more than the average student will do.

In case of the slower and poorer students, the choice will tend to lie between getting a confused and superficial view of a great deal of material and getting a good understanding of the simpler fundamentals. Certainly the latter is preferred.

16. *Students should be trained in methods of study at all school levels and in all courses.* It is now accepted that many students fail to do good work partly because they do not know how to study. For this reason courses on study methods and techniques have been put in especially at the college level. It is also accepted that work at the graduate level involves considerable training in research methods. Hence when we consider that research is simply a particular form of study, it should be evident that training in study methods is needed at all levels. As a matter of fact the work on supervised study appears in general to have been more profitable to the poorer students, but there have been notable exceptions to this. In some

cases the application of scientific principles of learning has been very valuable to excellent students. In Chapter 13 we shall consider in greater detail what can be and should be done to improve student study methods. It must suffice here to note and to emphasize the point that teaching students how to study is one of the primary functions of the teacher. The German philosopher Fichte once said that the purpose of the state is to make itself unnecessary. It was to do this by making such good citizens that they would not need supervision. Similarly it is the function of the teacher to make herself unnecessary to the students by training them in methods of study so that they will be able to learn without outside assistance.

17. *Locate and correct errors.* Here it would naturally seem is one of the primary functions of the teacher, but one that is in great danger of suffering from mass education. Error is in large measure an individual affair, but in an era of large classes it is probably asking a great deal to expect the teacher to locate and correct the errors of individual students. This difficulty often becomes greater when objective tests are used. Some teachers give objective tests to their students, correct them, and return the scores without returning the tests and without going over them in class so that students can learn what errors they have made. This is not effective teaching.

(In most elementary school subjects tests are available that can be used to diagnose individual errors and weaknesses. These can be used in such a way that the student can locate and correct his own errors, and this can be done even where the teacher has enormous classes.) Furthermore it can be done in such a way as to lighten the teaching load. Unless attention is given to this point students will continue from year to year to make the same common errors. They will confuse the spelling of *two*, *too*, and *to*, or they will say five times one equals six—long after they should have corrected such errors. Some graduate from college without ever getting some of these elementary school fundamentals straightened out.

Here again a basic reason for our failure to do better work is found in the fact that we attempt to cover too much ground. In

our haste to teach new material we fail to correct the errors in the old material.

18. *Measure and evaluate pupil progress.* In part this principle is related to the last one because tests are used for the location of errors. But tests and other methods of appraisal have additional important functions in connection with teaching. They are necessary to determine the extent to which the objectives aimed at have been reached. When, as is often the case, further teaching is needed in order to reach objectives, suitable tests will indicate more precisely the additional instruction needed.

When the results shown by tests are not satisfactory, it is frequently as much the fault of the teacher as it is the fault of the class. In any case the situation requires analysis: the class may have lacked adequate background, the assignment may not have been clear, or it may have been excessive. Or various other factors may have been involved.

19. *Report test results to pupils.* Although some educators decry the use of tests to motivate learning, they do serve that purpose. Also, learning is more effective when the pupil knows what progress he is making.

In order for tests to be most effective, they should be returned as soon as possible after they are given and the errors of each pupil should be indicated and corrected. One of the most important functions of such returned tests is that they motivate and guide future study. Pupils learn in this way more precisely what is expected and tend then to adapt their study methods to different requirements.

20. *For best results the teacher must establish proper rapport with the children.* Manuals on individual mental testing emphasize the importance of establishing good rapport between the tester and the testee as a preliminary to effective testing. This also holds true for teaching. (If students like and respect a teacher they will work harder and learn more than if the opposite situation holds.) Theodore Roosevelt was especially remarkable for his ability to make friends with all kinds of people. To begin with, he liked all kinds of people

and he had the ability to talk to them on their level without affectation. So when he met and talked to a man he made a friend. Likewise for teachers: they can get the best results only if they have a real liking for children and are able to meet them on their own level. Ideally, the child should respect the teacher without appreciable fear and should like her without too much familiarity.

(21. *The teacher should be honest.* While this may seem a commonplace and gratuitous statement it is by no means an easy one to live up to. In fact, to tell the exact truth is frequently a human impossibility. There are two situations especially that the beginning teacher must meet and master: these are learning to confess ignorance and to correct errors. No teacher knows everything or can be expected to know everything, but all of us are more ignorant about some things than we should be. From time to time pupils will ask questions that invade these dark areas and cause some embarrassment to the teacher. When that happens she must have the honesty and the courage to say: "I should know that but I don't." Of course, some questions will be such that she can simply confess ignorance by saying, "I don't know," or in other cases where the information is not available, where no one knows the answer, that can be pointed out. These latter cases are not difficult, but the first one is.

Even more serious is the problem of error. When a teacher makes an error through oversight, it is usually easy to correct, but when she makes one through ignorance, it is not always easy to come back to the class and make the correction. Yet in the long run it is necessary both for self-respect and for retaining the respect and confidence of the class. It is very important for children to learn to face and correct their own errors; the teacher should supply them with a good example in that respect.

(22. *Be fair and impartial.* These qualities are even more important than honesty in obtaining and holding the proper respect and regard of the students.) Young children have a strong sense of justice in regard to those matters that are within their experience and comprehension. Likewise they object to partiality. All of us are

familiar with the expression, "Teacher's Pet," and few children care for that label. It is natural for the teacher to show favors to the bright and pleasing child, but this tendency must be held in check both for the sake of the child concerned and for the teacher's reputation.

As an indication of the way in which a teacher's personality and methods contribute to teaching success we may take the description of "My favorite teacher" by a college senior⁸ (p. 81): "Is fair, believes in giving every person an equal chance, both in oral and written work, will tell concisely what is expected of student, work required, tells this at the beginning of the semester, has a sense of humor and patience; understands material perfectly, uses different method devices, correlates subject-matter with present day."

23. *Efficient work requires suitable order and discipline.* In some psychological experiments absolute quiet is necessary for success. In some activity projects a great deal of noise and commotion is to be expected. The kind of order required varies, therefore, according to the work to be done. In general, modern educators favor the greatest degree of freedom from repression that is consistent with the accomplishment of the task at hand. Yet when hard intellectual concentration is required, it is especially important that distractions be eliminated or reduced as much as possible.¹⁰ This and other aspects of the problem of discipline will be discussed in Chapter 17.

24. *Provide a good psychological and physical environment for learning.* General environmental conditions and atmosphere are important determiners of pupil attitudes and character. They also influence the efficiency of learning. For this reason it is of the greatest importance that the teacher strive to maintain a cheerful and wholesome atmosphere in the school. Some school rooms are barren, dirty, poorly lighted, poorly ventilated, improperly heated, and badly equipped. Some school toilets are filthy, and some school playgrounds are very inadequate. To this unsatisfactory material environment may be added a mental atmosphere of indifference or of tension, irritation, and nagging. Is it any wonder that many pupils have found attendance at school so lacking in satisfaction

that they have played truant or have, when the law permitted, dropped out of school entirely? Parents who have spent much money to provide a home of comfort and even of luxury for their children often seem quite content for these same children to spend their school hours in an environment that is barren, unhealthful, and annoying. The school is in reality something of a second home and should be equipped and managed in such a way that children can be physically comfortable and mentally at ease. When this is not the case, the teacher will be greatly handicapped in her efforts to secure the right kind of learning.

25. *Consider the by-products of learning.* We now place great emphasis on the training of the whole child. In order to meet this requirement we shall find it necessary to consider not only the direct and specific intellectual learning that results from teaching a particular topic or unit but we should also consider the effects of this learning on the development of attitudes and new interests. Not infrequently students learn the specified assignments and pass tests with satisfactory or even with high grades but develop at the same time a distaste for the subject, and quite possibly something of a distaste for education in general. When this occurs the training is less likely to be of permanent value because the things learned are more likely to be forgotten and are less likely to be transferred to life situations. For this reason the teacher should be concerned to develop favorable attitudes and new interests in students.

The particular units and projects included in a course are obviously of importance. So is the textbook, if one is used, and so are the assigned readings and the laboratory experiments and the demonstrations. Changing textbooks in a course frequently makes a considerable difference in the attitude of students toward the course. And, of course, changing the teacher may make an even greater difference in some cases.

We are not yet able to measure exactly these changes in attitudes and interests, but the alert teacher can discover with a fair degree of accuracy the reactions of a class and so can reach a fairly reliable judgment as to what has happened to student attitudes and

interests in the course. The important thing is that the teacher be fully aware of the problem and attempt to do something constructive about it.

TYPES OF LEARNING SITUATIONS

In this chapter our problem is primarily to point out some of the fundamental principles to be considered in all teaching situations. There are, however, different types of learning situations that call for different teaching procedures. At this point we shall outline these briefly, then consider them in greater detail in succeeding chapters.

Sensory or Observational Learning.—All learning is based on sensory experience. In some of these cases the sensory element is of secondary importance so that the learning can more conveniently be classified under other heads, but when the learning is concerned primarily with learning the characteristics of the concrete world it seems more convenient to classify it as observational learning. This is particularly important in the early years of childhood because the child must learn to recognize and discriminate many objects. It continues important throughout life. Laboratory work and field trips in college science courses require much observational learning. Teaching procedures in connection with this type of learning will be discussed in Chapter 6.

✓ **Rote Memory Learning.**—Much of our school work is concerned with symbols, as in language and mathematics. Probably most of this involves rational associations, but in many cases the rational element is not very important, and in many cases where there is a rational basis for the associations they are most effectively learned by methods adapted especially to nonrational material. Here may be listed the combinations in arithmetic and, frequently, formulae in the sciences. Spelling in English is so largely irrational that it is best treated by rote memory methods. Whenever the material to be learned is lacking in rational associations, or when rational material must be used in a mechanical manner, the rote memory

methods will generally be most effective. These will be discussed in Chapter 7.

Rational Memory Methods.—Rational memory depends especially on understanding and meaningful associations. A well-taught course in social science should emphasize these factors although it will be necessary also to include material of a nonrational or rote memory type. In general we find that rote memory is relatively more important in the early years while rational memory is relatively more important at the college level. Neither can be entirely eliminated at any level. Methods to be used in teaching material of the rational memory type will also be discussed in Chapter 7.

Methods in Teaching Reasoning.—Reasoning involves a process of solving difficulties through a process of thinking. The solution must be novel and original for the individual, although it may not be new to others. We talk much about training students to reason in our schools, but actually it seems that we do very little of it. More often we make requirements that are most easily met by memory work. Even in such mathematical subjects as algebra and geometry we find that there is relatively little reasoning but much memorizing. Yet there is some reasoning in the schools and there might be more. We shall consider the problem in more detail in Chapter 8.

Methods of Teaching Motor Activities.—Handwriting, dancing, golf, and painting are examples of activities that may be taught in the schools, either public or private. They are quite unlike most of our school work and for best results require different methods. These will be discussed in Chapter 9.

Methods of Teaching Attitudes.—Attitudes are concerned primarily with our feelings toward things and with our tendencies to react favorably or unfavorably to people, ideas or situations. They are an important aspect of personality and character and for that reason they have been receiving an increasing amount of emphasis by modern educators. The relationships of teaching procedures to the development of attitudes will be discussed in Chapter 10. This will complete our survey of important principles of teaching.

If this analysis of different types of learning is to be most useful to the teacher, it will be necessary for her to be prepared to analyze each teaching situation and to determine the type or types of learning desired. This approach has an advantage in that it becomes possible through the use of these principles to do better teaching in anything from a traditional school to one of the most progressive variety.

The complaint has frequently been made that the teaching methods taught in schools of education cannot be used by many teachers because they find themselves teaching in traditional schools and cannot change the system.¹⁹ If, however, the teacher understands some of the more important psychological requirements for effective learning and applies these in her teaching, she can get much better results even in the most traditional school. After all, much excellent teaching has been done in traditional schools. On the other hand, the teacher in a progressive school system with excellent facilities may fail to secure a desirable degree of pupil progress through failure to observe some of the fundamentals of good teaching. It was with the idea of giving prospective teachers a group of principles that would be applicable in nearly all types and levels of schools that the principles in this chapter have been presented.

QUESTIONS AND EXERCISES

1. Why may different experimental studies of particular teaching methods give conflicting results?
2. What are the special features of the Morrison teaching methods?
3. For what type of teaching is the Herbartian method especially applicable?
4. What are the strongest and weakest aspects of Progressive methods of teaching?
5. How are educational aims related to efficiency in teaching?
6. What is meant by "direct teaching"? What are its advantages?
7. How are rewards and punishments related to learning?
8. What objection may be raised to "making a subject interesting"?
9. What is the importance of sensory experience in learning?
10. How may a teacher make adjustments for individual differences in rate of work?

11. How may Herbert Spencer's principle of development be applied to teaching?
12. How is the principle of "apperceptive mass" to be used in teaching?
13. Suggest several specific measures a teacher may take with reference to the correction of errors.
14. Why is it important to measure pupil progress? Why important to report the results to the pupils?
15. How does the general school environment affect learning? What may the teacher be able to do to improve this?
16. What is meant by the by-products of learning? What is their importance?

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CHAPTER 6

OBSERVATION AND THE DEVELOPMENT OF CONCEPTS

All conscious experience and all learning begin with sensory stimulation. This point has been emphasized by numerous philosophers of the modern period and it is supported by contemporary scientific psychology. Each of our senses enables us to react to some aspect of our environment and through the senses we become aware of the objective world and of our own bodies.

Human adults rarely if ever have conscious experience that can be called purely sensory: in nearly all cases when we experience sensory stimulation we interpret the stimuli in terms of past experience. We call this interpretation of sensory experience perception, and we call the mental content in a particular case a *percept*. If, for example, at about 11 P.M. as we are dropping off to sleep the air is violently disturbed by vibrations that seem to come from the alley fence, we may identify the sound as coming from two cats who are having an argument which does not seem to be entirely friendly. We are enabled to make this identification and interpretation because at some time in our past experience we have seen cats at the same time that they produced such sounds, and, since we have probably never heard such sounds from another source, we rather confidently assume that cats are responsible for the present disturbance. In the same way during our waking experience we are constantly interpreting the complex stimuli that impinge on our senses. At the present moment a blurred, whitish figure moves across the fringe of my field of vision on the right, and at the same time I hear certain sounds. Without looking around, I know that a man who is wearing a white shirt is walking by the window. I do not know who he is, but, if I looked more closely, I could probably call his name, and I could also very probably make other associations based on past experience.

Herbart and his followers called this process *apperception* instead of perception, and they called the past experiences that were associated with the stimulus in the process of interpretation the *apperceptive mass*. They also emphasized the point that good teaching always requires the interpretation of the new in terms of what is already known.

Learning by observation, which means the same thing as learning through perception or through sensory experience, involves in the first place the perception of particular objects or stimuli. The infant learns to recognize objects through vision, hearing, and other senses. As this learning continues, the same person or object is seen from different angles and in different positions, and in case of persons, they are seen in different clothing. Experiences gained through the different senses are correlated, as when the mother's voice is associated with her face and figure and with the feel of her hands and body. In a similar way the visual impression of a dog is associated with the feel of his fur and with his bark and odor.

From these different experiences the infant gradually builds up a more or less generalized idea of the object or person. He learns to recognize his mother whether she is wearing a white dress or a blue one, whether she wears a hat or none. These generalized ideas, which are based on a comparison of and abstraction from a number of particular perceptual experiences, are called *concepts*.

It is because of the fact that perception tends inevitably to lead to the formation of concepts that we have chosen to treat the two processes together in this chapter. Technically, the process of forming concepts involves inductive reasoning, and consequently it belongs logically in the chapter on teaching procedures in connection with reasoning. For our purposes, however, the grouping used here seems preferable.

Experiments on observation and testimony have revealed some very significant facts. Experiments have been conducted in which certain prearranged acts have been performed before a group who have then been asked questions about what happened. On this basis, it has been determined that the average honest individual is quite willing to swear that he saw things occur which the experimenter

knew did not occur. When numerous specific questions are asked about an occurrence, it is not unusual to find that the average observer is in error on 20 per cent of his answers if he was not excited at the time of the observation. When, however, observers are excited at the time observations are made, the percentage of errors is normally higher. Even trained scientists make many errors when observing things outside of their specialized fields, and, quite naturally, we cannot reasonably expect children to do as well as adults.

These experiments show that our powers of observation are more limited than is usually believed. The same conclusions may be reached also through a study of tachistoscopic perception. The tachistoscope is an instrument for exposing material visually for a very short period of time, usually a fraction of a second. With an exposure time of about one-twentieth of a second, the average college student can grasp and reproduce only about two or three capital letters, such as K, T, and Y, if the letters are placed in unusual positions such as being printed upside down or being rotated through ninety degrees. When letters are printed normally and combined into short words arranged in meaningful sentences, however, thirty or more letters may be grasped at once.

This latter fact shows the importance of past experience in facilitating perception. Consider the letter combination LNAEIUNFGM. If these letters were read once to the average person, or were shown in the tachistoscope for one-twentieth of a second, most adults could not repeat them. If, in contrast, we rearrange the letters into the word MEANINGFUL, there will be no difficulty in grasping them and in remembering them.

When the average American sees a page of Chinese characters he does not see the details and could not reproduce them. The process of learning Chinese involves learning to discriminate these details and to make meaningful associations with the different characters. This is true of perception in general: we learn to discriminate between things and to associate different meanings with different sensory cues. We see one leaf and we know that it came from an oak and that it grew along with some acorns, and we see another

leaf and we know that it came from a peach tree. We recognize one odor as that of a rose, but we recognize another odor as that of a rarely seen nocturnal carnivore with a bushy tail and a beautiful fur coat but with an odor that discourages familiarity.

Associated with the fact that our perceptual capacity is limited, is the further fact that we do not become aware of everything within the range of our senses, but only of those things, or a part of those things, to which our attention is directed. We may look over a crowd of people without really seeing any one person in the crowd. Then again we might see clearly one person in a crowd and be only vaguely conscious of the crowd as a whole.

Voluntary and spontaneous attention are very largely controlled by interest, either indirect or direct. We attend to those things that are meaningful, significant, and important to us. We tend to ignore the ordinary things that have no special significance or interest for us at the moment. Members of a class may take a course in a particular classroom for an entire year and at the end of the year not be able to state with certainty the number of windows in the room or the color of the walls. On some other matters they may be able to answer with certainty. They may, for example, be quite sure that the chairs did not have comfortable cushions.

Since our power of observation is limited, since we tend to observe only those things to which our attention is directed, and since we attend more readily to those things in which we are interested, it is evident that certain definite limits are placed on the capacity of students to learn from observation. Successful teaching must take these limits into account.

Sensory Factors.—We have noted that perception begins with sensory stimulation, and in the discussion of individual differences we found that psychological capacities show variations in different individuals. These variations are especially great in the sensory field. Some children have very poor vision or hearing, whereas others have very superior sensory acuity. At least 10 per cent of school children have fairly serious visual defects; about 5 per cent of the boys have partial color-blindness; and about 2 or 3 per cent of both sexes have a serious deficiency in hearing.

Systematic tests of sensory capacities given at least every two or three years will be necessary to locate these cases of deficiency because the children are frequently not aware of the extent of their deficiencies and ordinary observation on the part of the teacher may not detect them. Many children will need to have glasses fitted in order to do school work properly. It will also frequently be desirable to seat children in the front of the room in order to make it easier for them to see the blackboard and to understand the teacher. Those with extreme defects will usually succeed better if placed in special rooms with special teachers. However, if this is not possible, children with normal or superior intelligence may do surprisingly well in regular classes even when they have severe sensory handicaps. At the college level the writer has had students do good work in spite of complete deafness or blindness, although such students will, of course, usually need some special assistance from the teacher.

Meanings in Perception.—Perception is the interpretation of sensory stimuli, and interpretation is the process of associating the stimulus with past experiences that make it meaningful. A beginner in Latin might, for example, see the word *pons* and not know its meaning. He looks in the vocabulary and finds that it means *bridge*. If he remembers this, he thereafter perceives *pons* as a meaningful word. In the same way, we may see a dog and recognize the dog as belonging to a particular breed, and as being the property of Mrs. X. As a rule, the greater the number of associations we make with past experience, the more meaningful the perception. Consequently, several people may see the same thing, but it may mean different things to each of them. Mrs. Y might see the dog referred to above and think of him as the nuisance that turns over her garbage can every night. Mrs. Z might see him as the source of various nocturnal howls and barks which disturb her slumbers.

In teaching, the new acquires meaning as it is linked up with the familiar. The more associations the observer can make, and the more significant these associations are, the greater the meaning that forms a part of the perception. This involves a difficulty in that different members of a class will not have had the same experiences and consequently they will get somewhat different meanings from

the same language or examples. One professor of theology realized this quite clearly and took it so much to heart that he required his students to write up his lecture notes and turn them in. He then read and corrected the notes of the entire class. He realized that serious and attentive students might completely misunderstand the ideas he had tried to convey. Although this is especially likely to happen in an abstract subject such as theology, it happens in connection with simple sensory observation as well. The city boy who referred to the cow's handle bars was making a very natural association, but the implications were at least unusual.

When new things are to be learned, appropriate experiences must be arranged as a part of the learning process. No competent teacher would attempt to teach comparative anatomy without laboratory work or illustrations, and no text in comparative anatomy would be published without illustrations. In the laboratory work itself, it is necessary to call attention specifically to a multitude of details if these details are to be observed. Otherwise the student will tend to get a general and perhaps confused picture of the whole. In this sense, the perception of the whole will contradict the favorite Gestalt maxim and will be much less than the sum of the parts. One experienced teacher of comparative neurology once said that it is impossible to learn the anatomy of the brain stem without handling thousands of microscopic slides of the region. This implies the principle that observations must be numerous and varied if the student is to become familiar with complex novel things.

Whole and Parts.—Observations tend at first to be in terms of wholes. People are confused with each other because they show a general similarity in appearance. The writer once had two different girls in two different classes for two weeks before he realized that they were different. The similarity was sufficiently great that he thought they were the same person. With further experience we analyze these total experiences and note details. This is the basis of finer discrimination. After having the two girls in class for a semester the writer was surprised that he had confused them in the first place. In another case, he had identical twin girls in class for a year, and the only difference he discovered was that the teeth of

one were slightly different from those of the other. Doubtless their mother could see a number of small differences.

The above facts may give us a useful idea as to teaching procedures. If we wish to teach the map of the United States, we begin with a general outline. In drawing the coast line we do not attempt to put in all of the minor bays and peninsulas. We add mountains and rivers without too much attention to detail at first. Beyond this, we add such details as are necessary for our purpose. The older formal geography included such a mass of details that it could not be remembered on the basis of the limited experience provided; and, furthermore, it was not worth remembering for the average person.

Significant details are analyzed out of the total. The beginner must learn the functions of the various buttons, levers, and pedals before he can operate an automobile. Until that time, he simply takes his seat and leaves the rest to the driver. When a picture or a film is shown, the important details will need to be pointed out explicitly. A good procedure in showing instructional films is to run the film through once so that the class can get an understanding of it as a whole, then show it again or as many times as necessary to bring out the additional specific points. One showing is usually not enough.

As necessary details are observed and learned, the more important relations between parts will begin to emerge, and from these it is possible to synthesize a new and more significant whole. In studying the map of the United States, the mountains, rivers, soils, rainfall, and climate can be seen to determine in large measure the distribution of the population and the location of the cities. New York and San Francisco are, for example, the natural results of the geography of the respective regions. Both have fine harbors and are well located to handle ocean commerce.

In most subjects there is no end to the extent to which analysis may be carried and no end to the number of specific points that may be learned. But there is a practical limit beyond which it is not profitable to go in this matter. The average student will have neither the interest, the capacity, nor the need for extreme analysis or for the mastery of endless details. Because of this fact, some reasonable

limit must be imposed on the extent to which time is spent on less important items. In general, it is the function of advanced and more specialized courses to pursue this more detailed study. For introductory courses, and for the average student, the more general survey is all that should be expected.

Gestalt psychologists have stressed the importance of general patterns in perception and some at least of the Gestalt psychologists have minimized the importance of analysis. Analysis is a necessity, however, if the whole is to be understood. Only after the nature and functions of the parts are known can the operation of the whole be really understood. If one does not understand the operation of an automobile differential, he cannot understand how the rear wheels rotate when the car makes a turn. Gestalt psychology is, however, correct in stressing the fact that the relation of the parts to the whole must be kept clearly in mind. And, of course, as we grasp the functions of the parts and their relationships the meaning of the whole becomes fuller and more significant.

Concepts.—A percept is, as we have noted, our consciousness of a particular object, or our interpretation of a particular sensory stimulation. Thus when the child sees a particular dog he has a percept. When he sees several dogs he builds up a general idea of dogs, and this general idea is a concept. Concepts are, then, the generalizations based on a number of percepts, and language is made up of concepts associated with verbal symbols. Each word thus represents one or more of these general ideas or concepts.

Concepts are of various kinds. We have concepts of individuals as well as of classes, and we have concepts of abstractions as well as of concrete things. When we meet a new person, we begin to form a concept of him, and as we have more experiences with this individual the concept of him grows. After years of experience, we have a definite and detailed concept, although by no means a complete one, of what he is. Consequently for each of the people we know, we have separate concepts. We also form concepts of relations such as *in* and *out*, of qualities such as *sweet* and *green*, and of terms such as *peace* and *morality*. These, however, are more abstract and more difficult.

The Growth of Concepts.—We have learned about the growth of concepts from studies of the growth of language, from the standardization of intelligence tests, and from more direct studies of concepts.

The first words learned by the child relate to particular people, to objects, and to actions, as *mamma*, *ball*, *throw*, and *drop*. Only later is there an understanding of terms indicating relationship and abstract qualities.

An average child of five years will define things in terms of what they do, or in terms of the way they fit into his experience. "A dog barks." "A pencil is to write with." "A table is to keep your elbows off of."

At about the age of seven or eight years, these definitions show evidence of classification or of analysis. "A dog is an animal." "A dog has four legs." "A pencil is made of wood and lead." "A pencil is something to write with. It is long and thin." The use of the word "something" as a classification marks the definition as being above the lowest level. With further mental growth and experience, both the classification and the description of characteristics will, of course, become more exact.

At the age of ten or twelve years abstract terms such as *peace* and *justice* begin to be understood. Also, at about this age, conjunctions expressing discordance, such as *although*, begin to be used.¹⁸ Conjunctions and adverbs such as *however*, *moreover*, and *inversely* do not come into common use until development is about complete, and then only for those of better than average intelligence.

The implication of these age differences is that we shall be very largely wasting our time if we try to teach concepts before children are ready to understand them. Children in the kindergarten and in the early grades can understand concrete objects and particular events, but they have very limited powers of abstraction, generalization, and integration. Consequently the elementary school teacher will be successful largely in proportion as she teaches the concrete and the particular, while the senior high school teacher may reasonably hope to be more successful in developing abstract concepts and generalizations. Even in senior high school, however, the less able students will have great difficulties in dealing with the more abstract

materials, and in college only the better students will find philosophy at all easy to understand.

The application of this to the Herbartian five formal steps, or to related procedures in teaching, is obvious. In the early grades, teaching will be confined largely to the first two steps: preparation and presentation. The last three steps: comparison and abstraction, generalization, and application, cannot be expected to give very satisfactory results. However, as children mature mentally, these last steps become possible and more fruitful.

It is fundamental for good teaching for the teacher to understand that concepts grow with experience and that this growth is conditioned both by the mental capacity of the child and by his new experiences. Because of this, different children of the same age and grade will vary greatly in the number, in the complexity, and in the accuracy of the concepts that they have. And a particular child will have fairly accurate concepts of some things and quite inaccurate concepts of other things.

Definition.—In order to define a term or concept we give a statement of its intension and extension. The extension of the term indicates the range of its application and the intension gives the essential qualities involved. In actual definition these overlap. When we say that a dog is a mammal and a quadruped, we are giving essential characteristics and at the same time we are eliminating from the classification all animals that are not mammals or are not quadrupeds. Only a scientist who has studied dogs could be expected to give a precise definition of dog which would correctly state the extension and the intension of the term. In other words, most of our concepts are somewhat vague and inaccurate. It has long been recognized that one of the primary functions of science and of philosophy is accurate definition. And by implication, this says that we are not to expect children to develop precise concepts. We can get reasonable accuracy, but if we try for more than that we shall be disappointed.

This fact makes it possible to clarify somewhat the problem confronted by the teacher. Children's concepts are to be extended in number and in accuracy; and improvement in accuracy will involve

a more precise understanding of the intension and extension of concepts. These are based on analysis and classification. The teacher will need, therefore, to present enough examples and to spend enough time on bringing out the significant aspects of these examples to obtain the desired results. Also, there must be some effective method of locating and correcting the individual errors in concepts.

READING

In the psychology of reading we bring together the principles of the formation and use of concepts and their association with printed symbols. Reading is perception in that it consists of the interpretation of stimuli, the stimuli being the printed or written words. As we have seen, words represent concepts. In order to read, then, the printed symbols must be associated with concepts. For the beginner to perceive and understand, "The dog runs after the cat," he must have already developed concepts for *dog*, for *cat* and for *runs after*. The small child who reads and understands "The dog runs after the cat," does not read and understand "Ontogeny recapitulates phylogeny." He has no concept of any of the three words in this short but formidable—and scientifically questionable—sentence. Some children will finally reach the point at which they understand these terms, but most will never do so.

Learning to read musical and mathematical symbols is similar in principle to learning to read a language. These symbols are, in fact, languages: they convey meanings just as words do. Musical and mathematical concepts must be developed from experience with particular examples, and these concepts must be associated with the appropriate symbols before reading is possible.

Reading is a very complex process. In fact, Burkart³ concludes that the total process requires some 214 separate abilities. These abilities may be classified roughly into three main groups: sensory, motor, and intellectual.

Inasmuch as reading begins with a visual impression, the functioning of the eyes is an important factor. Children may have difficulties because of optical defects in the eyes or because of defects in the functioning of the eye musculature. Consequently, since eye

structures and functions mature just as other parts of the body mature, some children are likely to find reading difficult because of a lack of adequate development of the eyes.

Hearing is also obviously related to reading in that lack of maturation or other auditory deficiencies will interfere with learning to understand spoken language and with talking; and, in such cases, the interpretation of printed symbols will be more difficult and less adequate.

In the process of reading, the eyes do not move smoothly along a line. Instead, there is a fixation near the beginning of the line and a word, or perhaps two or three words are perceived, then the eyes move quickly to the right and pause for another fixation. This process continues to the end of the line and then the eyes swing back to the beginning of the next line and the process is repeated. The number of fixations per line is determined by the amount of material that can be grasped at a single fixation and this is determined by the mental maturity of the individual and by the familiarity of the material. In rapid reading, more words are grasped at a single fixation, the fixation times are shorter, and the eyes move more rapidly. Also in poor readers there are more eye regressions: the eyes at times move backward along the line instead of going regularly forward.

When children are learning to read, they naturally associate the printed words with speech and tend to pronounce the words as they read. In time, this vocalization drops out in case of the best readers, and reading occurs at a rate faster than is possible with vocalization; but poor readers continue to vocalize longer, and their lips can be seen to move as they read. If they can be taught to relax the lips and vocal mechanism, reading speed is usually improved.

The most important factor in determining the efficiency of reading is the interpretation of the symbols. This is done by associating the printed symbol with already developed concepts and verbal symbols or words. A necessary background for effective reading is, therefore, an adequate stock of concepts, and many of the difficulties that children have with reading are due to a deficiency in this respect.

Children's concepts depend both on mental maturity and experience. A number of investigations have shown that a mental age of about 6.5 years is needed for average success in learning to read, and one of the chief reasons why this mental level is needed is that younger children lack both the requisite learning capacity and the understanding of language that are necessary for reading. However, even if a child has a mental age of 6.5 years or higher, he may be very deficient in vocabulary with the result that he is not ready to learn to read. The indicated corrective in this case is to give more training of an observational type and see that the necessary concepts and vocabulary are developed before an attempt is made to teach the printed word symbols. In case of average children, there is good psychological reason for believing that more time could profitably be spent in the first two grades in observational learning and in the development of appropriate concepts with less time spent on formal reading. In case of slow children, an even longer time might well be spent on giving an adequate background for reading.

The importance of mental maturity and experience in making the learning of reading easier is very well shown by the results obtained when illiterate adults are taught reading. If they are of something like normal mental capacity they learn to read much more rapidly than children. If, then, we gave more attention in kindergarten and in the first grade to the development of vocabulary and concepts, the later progress in reading would more than compensate for the delay.

Several problems in reading deserve special attention. A century ago children were usually taught the alphabet before being taught to read. Then it was discovered that words were read as wholes and that they could be taught without first teaching the letters. Some educators accordingly concluded that it was very bad to teach the letters first, and in some cases the alphabet was never thoroughly learned.

The writer believes this practice is unsound. It is true that words are read as wholes, or even as parts of phrases and sentences. It does not necessarily follow from this, however, that a knowledge of the letters will interfere with a perception of words as wholes. College students usually know the letters quite well, but in spite of this

familiarity with the letters they read the words and phrases as wholes at a faster rate than elementary school children can read them.

Indirect evidence to support this position is found in an experiment by Unzicker.²³ Children who were beginning to learn to read were taught the use of a typewriter, which necessarily required attention to individual letter forms, and it was found that they made more rapid progress in learning to read than was made by children who did not use the typewriter. A reasonable interpretation of this experiment is that a knowledge of the letters assists in word discrimination, even if familiar words do tend to be read as wholes; and, if this is true, it seems unwise to deprive children of this aid. Gestalt psychology indicates that words will be perceived as wholes regardless of our familiarity with the constituent parts. So whether we learn the alphabet at first or not, as we become familiar with words we shall read them as wholes. When we wish to discriminate between two familiar objects, we naturally compare details. This is equally true of words. Hence a knowledge of the alphabet should assist in word discrimination.

A second problem has to do with the teaching of phonetics. It has been assumed, and likewise denied, that a knowledge of phonetics will assist the child in dealing with new words. The prevailing opinion is that phonetics should not be taught at the beginning of the first grade. Children do not have sufficient capacity to synthesize sounds at that time. Later, at the end of the first grade or in the second grade, a knowledge of phonetics may be helpful, but even then it appears that all children will not be helped. Some children are so weak in auditory imagery and in power of synthesis that they get along about as well without phonetics as with them. By about the fourth grade, however, children can learn to use a dictionary and to use that method to learn the pronunciation and meaning of new words. Below the fourth grade level, the value of phonetics would be chiefly to assist the child in recognizing the symbols for words that he already knows.

The Improvement of Reading Ability.—Much effort has been spent on the improvement of speed and comprehension in reading. Normally we find that as children grow older and read

more, their speed and comprehension also improve. Also we find at the college level that there is a correlation between speed and comprehension in reading and the amount of reading that has been done. Science students are presumably as intelligent on the average as students of English and history, but science courses do not usually involve a great amount of reading, and, as a result, the reading scores of science students tend to be lower. One of the best methods of improving reading ability is, therefore, to get more reading done.

Murphy has shown that in the early grades poor readers can often be helped by giving special training in auditory and in visual discrimination.¹⁸ This experience helps first by giving better discrimination for the sounds of words and then, when the words themselves are better understood, the training in visual discrimination assists in recognizing the printed words with greater speed and accuracy. In general agreement with this conclusion is Renshaw's¹⁸ finding that the span of visual perception can be increased by training with the tachistoscope. Moving picture films and other devices have been developed which give the same kind of training as that secured by using a tachistoscope, and Cason⁴ reports that at the third grade level these mechanical methods succeed in improving reading ability about as well as free library reading, although there are exceptions: some children make better progress without the mechanical aids.

Traxler²² points out that vocabulary is especially important in reading and for that reason an increase in reading comprehension will be largely dependent on increases in vocabulary. This will be particularly true in case of the poorer readers, and, consequently, they are likely to need special help in increasing both the extent and the accuracy of their vocabularies.

Traxler²¹ also points out that some individuals may be slow readers because their association times are slow and it may, therefore, not be profitable to try to get them to read rapidly. In such cases an increase in reading speed beyond a certain point would result in loss of comprehension.

In case of most pupils, however, it seems clear that a considerable increase in reading speed and comprehension can be obtained by means of training in auditory and visual discrimination, by drills to improve the span of visual apprehension, by paying attention to

vocabulary, and by requiring a great deal of reading. Rapid reading generally favors better concentration and better comprehension, although this will of course vary with the difficulty of the material.

Disabilities in Reading.—Burkhart's conclusions, referred to above, that there are 214 different abilities involved in reading, suggests that children may show about 214 different kinds of disabilities in reading. However, most of the cases of reading deficiency seem to depend primarily on a small number of factors.

Street²⁰ concluded from one study that 63 per cent of children fail in reading because of mental immaturity, 14 per cent fail because of personality difficulties, and 23 per cent fail because of difficulties with other tool subjects. There is so much evidence of the importance of mental maturity in learning to read that we may safely accept mental immaturity as an important cause of unsatisfactory progress in reading. There is also an increasing amount of evidence^{9,13} that emotional difficulties are important in nonreaders and that a mental hygiene approach is needed in connection with attempts at remedial work. Anything that seriously disturbs a child's emotional balance may at the same time disturb his school work. It is also true that reading abilities are specific in the sense that a child may be a good reader in one area and a poor one in another. Some generally good readers, for example, have great difficulty in understanding problems in arithmetic.

Defects in vision have also been found in a large proportion of children with serious reading disabilities.^{9,17} Hyperopia (far-sightedness) is rather common in young children and may cause a great deal of eye strain. Some children see better with one eye than with both eyes. Muscular difficulties are common. Some children whose eyes are good enough optically have difficulty with binocular fusion: they may see two images instead of one, or there may be a delay in the formation of a single image with a resultant slowing down of the process of reading. And, of course, myopia (near-sightedness) may cause a child to be unable to read the blackboard or charts.

Fortunately a large proportion of these visual difficulties can be very largely corrected by the use of appropriate glasses. It is very important though that tests of visual acuity be given to locate the

children with defective vision and that suitable glasses be obtained for them. Glasses will not correct poor binocular fusion, but specialists can give eye exercises which in most cases will result in a great improvement in fusion with a resultant improvement in the speed of reading.

By way of summary, it seems that most of the cases of serious disability in reading result from mental immaturity, or emotional difficulties, or visual defects. It is important that these cases be diagnosed early and that appropriate remedial measures be taken.

TEACHING FOREIGN LANGUAGES

The methods used by the armed forces during World War II in teaching foreign languages attracted special attention because they seemed to get good results in a short period of time.⁵ This, however, is what was to have been expected on the basis of a psychological analysis. Similar methods can be used effectively in the schools if the primary emphasis is placed on the acquisition of ability to read, to speak, and to understand the spoken language rather than on a knowledge of technical grammar.

There are three fairly distinct aspects of a foreign language that may be considered separately. These are pronunciation, vocabulary, and sentence structure, although correct pronunciation is, of course, not necessary for skill in reading.

If pronunciation is to be learned efficiently, there must be a great deal of direct sensory experience, that is, the learner must hear the language spoken under appropriate conditions.

Special attention should be given to the pronunciation of the sounds that are peculiar to each language. Americans have particular difficulty with the nasal sounds in French and with the umlauts and the "ch" sound in German, while Germans have trouble with the "th" sound in English because there is no corresponding sound in German. Additional drill will be necessary in these instances.

Since the pronunciations of individuals vary somewhat, it is very desirable that the voices of persons other than the teacher be heard either directly or through phonograph records or radio broadcasts. But in any case, if the ear is to be trained to recognize a

foreign vocabulary, there must be a great deal of hearing of the language.

This involves the important principle that "Appreciation precedes execution." Only after the learner appreciates clearly the nature of the sounds he is expected to reproduce can he be expected to make satisfactory progress in imitating those sounds. The teacher should, therefore, pronounce slowly and distinctly at first and should emphasize the important characteristics of the novel sounds. One of the best ways of doing this is for each member of the class to have a book open at the passage which the teacher is pronouncing and to follow the words as the teacher pronounces them. In this way the pronunciation will quite naturally be associated with the visual symbols.

If real familiarity with sentence structure is to be obtained, it must be done by hearing and reading a great deal of the language. The "feel" of the language cannot be gained by the study of grammar, nor can facility in the speaking or in the writing of the language be developed in that way. Children learn to speak their native language with fluency by hearing the language spoken, although most children will never learn very much about the formal grammatical structure of the language. The same principle applies to the learning of a foreign language; practice rather than theory is the chief requisite.

There have, of course, been numerous language teachers who have emphasized natural methods of learning languages. Some of these have made a great deal of use of "object teaching" and have not permitted the use of the native tongue at all even for beginners. There does not seem, however, to be any good psychological reason for avoiding the use of the native tongue until considerable facility has been gained in the use of the new language. Much time, effort, and misunderstanding can be saved by making a gradual transition to the use of the new vocabulary and speech forms.

For the most part, the concepts in a foreign language are the same as in English, but new concepts will be met, and it will often happen that direct translations will result in false ideas. In German psychology, for example, *Seele* does not mean the same thing that

soul means in American psychology. For this reason special attention should be given to the concepts used in other languages.

The learning of languages also depends quite obviously very largely on memory, and this aspect of the subject will be discussed in the next chapter.

TEACHING PROCEDURES

Various suggestions have already been made as to teaching procedures in connection with observational learning and the development of concepts. It is now in order to review and to supplement these suggestions.

Clear and detailed objectives are especially important if observational learning is to be most fruitful. Attention must be directed to the specific aspects of a situation that are important for the problem at hand. In a course in anatomy a laboratory manual with detailed instructions for making dissections may be necessary. On a field trip a mimeographed outline or check list may be essential. In a course in music appreciation, in which recorded masterpieces are heard, some kind of outline of the essential features of particular pieces of music will be needed so that students will know what to look for. In other cases the teacher should call attention to particular things as the observation proceeds. If this is not done, many members of a group are very likely to fail to observe what they are expected to observe.

Observational learning may be based on many kinds of materials. Blackboards are customary in classrooms, and they may of course be used for such sketches, pictures, charts, and diagrams as are within the abilities of the teacher to produce. A great variety of concrete materials may be obtained and used for demonstration by enterprising teachers. Returning travelers from foreign lands often bring back samples of products and costumes which they may be willing to lend for school demonstrations. When the concrete materials and products are not themselves available, it will often be possible to secure some kind of pictures. And if suitable projectors are available the teacher may be able to use slides, silent and sound films, both in black and white and in color, and television. This last medium has great possibilities which are yet to be developed. Charts

and drawings may also be made on suitable paper and kept for use from year to year. Maps and models are in common use, but models could profitably be used much more extensively where depth perception is important, as in solid geometry.

In music and in languages, phonograph records and other methods of recording sound now make it possible to use a wide variety of auditory materials. These recordings also enable a singer or lecturer to listen to his own product in a more objective way. This should prove useful to teachers of music, of dramatics, and of speech.

In case of both sound recordings and moving pictures there is one very important caution: it will generally be advisable that they be repeated several times in order that the desired observations may be more nearly complete and accurate. In case of moving pictures it will also very often be helpful if the projector is stopped at various points so that special attention may be called to significant details.

Laboratory work is a regular feature of courses in science and in some other fields, and, from a psychological point of view, the most important feature of individual laboratory work is that it provides a basis in direct observation for an understanding of lectures, textbooks, and other reading materials. Without such first-hand observation the student could not satisfactorily master such subjects as chemistry and biology. In addition, laboratory work has the advantages that accrue from learning through self-activity. In this respect it is superior to class demonstrations that are put on by the teacher.

When students are to learn to perform certain activities it is desirable that they first see these performances demonstrated. This will apply to such things as dancing, military drill, shooting a rifle, operating a machine, or knitting. Moving pictures may also be used for this purpose, and, in certain cases, they have the advantage that movements can be shown in slow motion so that they can be analyzed more effectively. When it is practicable, the teacher should, when demonstrating a movement, face in the same direction as the pupils. Otherwise there will often be confusion with respect to what is done by the right and left sides of the body.

In many cases, field trips will be necessary in order that satisfactory observational learning may take place. This has long been

recognized in such subjects as geology and biology, but in recent years such trips have become common in other areas of study. Psychology students will, for example, get a much better understanding of human deviates if they can visit institutions for mental defectives, for the insane, and for delinquents and criminals. In a similar way, visits to slum areas, or to factories, or to farms, may be of value to pupils and students in other fields of study.

It may be noted in passing that one of the best features of the progressive movement in education has been the emphasis on projects that involved a great deal of sensory observation and self-activity. These have tended to make school work more interesting and vital and have very largely avoided the excessive verbalism that was often associated with the older traditional schools.

Tests of Observation.—Tests of the accuracy and completeness of observational learning will be necessary for efficiency. When the material has been seen, the tests may take the form of sketches, drawings, objective tests, written reports, or oral discussions. In biology, drawings of specimens studied have long been used as a means of checking accuracy of observation. In some cases, however, the amount of time spent on these drawings might well have been reduced. Very often a form of socialized recitation may be used in which individual members of a group assume the responsibility of reporting upon and describing certain features of the observations made, and are then corrected, if necessary, by other group members. This practice will tend to stimulate greater interest, and, at the same time, it will encourage greater accuracy in future observations.

Verbalization.—One of the statements that has often been repeated by the enthusiastic supporters of audio-visual education is the Chinese adage that a single picture is worth a thousand words. This statement is often true but it may be quite misleading. A good Kodachrome picture of a rose covered float in the Rose Parade at Pasadena on January first may be worth more for certain purposes than any number of words. But simply to have a class look at pictures or at the objects themselves by no means completes the task of the teacher. As a general rule, observational learning is a means

to an end, and the end will generally involve the understanding of certain facts, the development of concepts, and perhaps the development of general principles. These will usually require discussion and verbalization. Concepts will need to be defined and general principles formulated. And after principles have been formulated, it will very often be desirable to discuss their applications and implications; for, as has already been pointed out in earlier chapters, only in this way can we expect learning to have the greatest transfer value. Instead, then, of considering pictures to be generally superior to words, we shall often be nearer the truth if we consider pictures and other audio-visual materials as a necessary means for the understanding of words.

QUESTIONS AND EXERCISES

1. Distinguish clearly between sensation, percept, and concept. How are these related?
2. Why are reports of observations often inaccurate or even false?
3. What is a tachistoscope? What does it measure?
4. How are interest, attention, and perception related? How does this relate to teaching?
5. Describe the normal course of the development of the perception of a complex object or situation. What bearing does this have on teaching?
6. What kind of concepts does the child have at five years? What kinds of concepts develop at later ages?
7. What should the teacher attempt to do in the way of helping children develop concepts?
8. Analyze reading into its most important psychological aspects.
9. How are sensory deficiencies related to learning to read? What may the teacher do to assist children with sensory handicaps?
10. What is meant by "mechanical" methods of improving reading?
11. What are the chief causes of reading difficulties?
12. How is vocabulary related to reading speed and comprehension?
13. What can be done to help children with poor binocular fusion?
14. Explain the principle: appreciation precedes execution. How is this to be applied in the teaching of the pronunciation of a foreign language?
15. What are some of the limitations of the audio-visual movement in education?

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CHAPTER 7

TEACHING FOR EFFECTIVE MEMORIZING

The Need for Memorizing.—Modern schools rightly emphasize the development of personality and training in attitudes and related aspects of development. Along with this emphasis, there has been a strong reaction against the curriculum and methods of the traditional schools in which the learning of facts played such an important part. Yet, in spite of these new points of view, in most schools the acquisition most necessary for success is a knowledge of facts and principles. Much is said also about teaching pupils "how to think," and this, too, is a commendable objective, but if a pupil would win academic laurels he will usually need, first of all, a good memory. Thinking starts with a problem and consists in the manipulation of facts and principles. Successful thinking usually is based on a knowledge of past achievements that are related to the problem. This means that learning, in the form of memorizing, is a necessary foundation for effective thinking. Inventions and wonderful discoveries are usually made by those who have first mastered what was previously known about the subject. Moreover, one of the best ways of learning "how to think" is first to learn how others have thought, how they have failed, and how they have succeeded.

Courses and teachers differ greatly in this respect, but, in most courses, there is much material which the learner needs to remember. Spelling is almost 100 per cent memory work. Even the combinations in arithmetic, although they are fundamentally rational, need to be remembered automatically if one is to do problems with speed and accuracy. Historians stress historical movements in terms of cause and effect, but history must have its names, dates, places, and events. The elementary student will find it necessary to remember many of these basic facts before he is in a position to see much in

the way of causal relationships. Similarly, most subjects have their special vocabulary, their symbols, their definitions, and their rules, which the student will usually find it expedient to learn, and which consequently the teacher should be prepared to teach effectively.

The traditionalists were often in error in that they asked the pupils to learn too many facts and did not pay sufficient attention to the development of meanings and understanding, with the result that much of the learning which actually took place was often superficial and of relatively little value. The sound procedure, however, would seem to be to correct these errors without throwing the baby out with the bath. If one is to be successful in making adjustments to the complexities of contemporary life, he must know many things and know them accurately, and it is the business of the schools to assist in the acquisition of this knowledge.

Teaching Methods and Memory.—Different teachers will use a variety of teaching methods, such as lectures, activity programs, individualized laboratory or project methods, socialized recitations, and so on; but regardless of the type of method used, one of the principal objectives will be to get the pupils to understand, remember, and be able to use the facts and principles presented. For this reason, the teacher needs to understand and to apply the principles presented in this chapter, and this can be done to a great extent in connection with any teaching method, although quite obviously, some methods are somewhat better adapted than others to particular kinds of learning.

An Analysis of Memory.—The word "memory," as ordinarily used, involves the retention, recall, recognition, and association of previous experiences. First, of course, something must be experienced. An impression must be made. Although this impression is not ordinarily considered in defining memory, it is a very important factor in determining the strength and accuracy of memory. In fact, it is largely through controlling the impression that we control memory. Retention depends on the strength of the impression, on the retentiveness of the individual's nervous system, and on relationships to other learning. The first and last of these factors are

largely subject to control; but there is less that we can do to change the second factor.

Recall can be improved through practice and through better organization of material. If a given stimulus-response connection is made sufficiently strong, the recurrence of the stimulus will ordinarily result in the response. Or, in case of rational associations, if material is well organized, it is generally easy to recall any important part of the whole.

Recognition seems to consist mainly of a feeling of familiarity, a feeling that the given mental content has been experienced before. It is not especially subject to control.

Association, in case of a typical personal experience, involves localization in time and place. I see a face on the street; I think I have seen that person before, because the face is familiar; but I cannot place it. Then suddenly I recall the time and place of the original experience, and the memory is complete. School work is not usually associated so definitely with particular times and places, but there must be some association if the experience is to be called memory.

When meaningful associations are reduced to a minimum, and we recall things as originally associated, we call the process *rote* memory, whereas we use the name *rational* memory when the associations are meaningful. This distinction is very important in connection with teaching methods and will be discussed more fully later. However, for the sake of accuracy, it should be stated that actual memories vary from those that are very rational and meaningful to those that are largely devoid of meaning. Consequently there are many memories that are intermediate between the two extremes. Also, in a single passage, part of the material may be quite rational while part may be lacking in meaning and may require rote memory. For this reason a mixture of learning methods will often be advisable. Memory may also be analyzed in terms of the senses and the resultant imagery that is involved. The original memory impression may have been gained through any one of the senses or through any combination of them. We see landscapes, hear music, smell perfumes, taste fruit, touch solid objects, and also sense movement

and changes in position. Any of these may be remembered, and, in the case of concrete objects at least, the memory experience generally involves the revival of imagery of the same sensory field as that of the original experience. In other words, our memory of a landscape is based on visual imagery, our memory of the music of a concert is based on auditory imagery, and so on. Consequently, we can have as many different kinds of memory as we have kinds of imagery.

Important variations, though, are found in the same sensory field. The sense of vision gives us color, and it also gives us form, magnitude, distance, and brightness. A person may have good imagery for color but very poor imagery for form. Another may be color blind but have excellent imagery for form. As a result, there are different kinds of memory in the same sensory field.

Another way to classify images and memories is into the concrete and the symbolic. Typical images and memories of things seen or heard are concrete. But we make a common practice of representing our images and memories by words and other symbols. Instead, therefore, of recalling a concrete visual image of an object previously seen, we may recall it by name without recalling the original image at all.

Much human thinking is done in terms of abstractions, and it is necessary to use symbols in thinking about these abstractions. As a result, much of what we remember is remembered in terms of words and other symbols. On the sensory side, our experience with words is usually confined to hearing, sight, and vocal speech, although some may think in terms of the hand movements involved in writing, while the blind may think in terms of their touch alphabet.

The Nature of Rational Memory.—We have already noted that memory consists of the retention, recall, recognition, and association of past experiences. In some cases this association is a relatively meaningless one, as when the paired associates method is used in learning nonsense syllables. If a pair, such as "yat-gep," has been learned, there is ordinarily no meaningful association but

simply the mechanical linking of the two syllables. When the association is of this type, we call the learning *rote* memory. If, however, we learn something that has meaningful associations we call it *rational* memory. If, therefore, a small boy goes on a difficult hike in the mountains and, as a result, becomes very sore and tired, the mention thereafter of "a hard mountain climb" will recall his own experience and will be quite meaningful. In common usage, we apply the term "rational" to memories if they are meaningful, whether the associations are in a strict sense rational or not. It would be more accurate if we used the term "meaningful" instead of "rational." As a matter of fact, some so-called "rational" memories are quite irrational, although it is to be hoped that most of the memories gained from school work will be rational rather than irrational.

Rational memory then emphasizes meaning, understanding, and the recognition of relationships. But these things depend on intelligence, as intelligence is ordinarily defined. Consequently, the more intelligent a student is, the more rational his memories can be, and the less intelligent he is, the more he will be forced to rely on rote memory in learning anything that to the intelligent student is rational memory material.

Since meaning depends on previous experience, if a memory is to be rational, there must be something significant to which a given new experience can be related. From this fact it follows that the more one knows about a given field, the more he can make use of rational memory, and likewise, the less he knows about it, the less he can use rational memory, even if his intelligence is high. As a result, the student beginning a subject is forced to rely somewhat more on rote memory, but as his knowledge grows, his associations become more and more meaningful. Students should be told this so that they will know better what to expect.

This increase in the possibility of making meaningful associations, which comes with increased knowledge in a particular field, results in a very considerable and a very important increase in the ability to remember things related to that field. This should not be confused with an increase in fundamental memory capacity because it does not involve that. The boy who learns a great deal about the

mechanism of guns will find it much easier to remember the mechanism of a new gun but he will not thereby be noticeably helped in remembering the details about the dresses worn by the young ladies at a party. A study of the qualities of the steels used in making the different parts of a gun will not be helpful in recognizing and remembering the differences between silk, calico, velvet, and chiffon.

As a practical proposition, rational memory is also influenced greatly by interest. If we wish to find the answer to a question, we ordinarily have no trouble in remembering it when it is learned. We think about anything that interests us. For this reason the interested person will seek out and make associations that the uninterested person will never make. Hence interest tends to make something more meaningful and therefore more rational. In some measure, then, interest and effort are a substitute for intelligence. Certainly the person of somewhat less intelligence, but of considerably more interest and industry, will have a more rational and intelligent understanding of a subject than will the somewhat more intelligent but less interested and less studious person.

A good illustration of the effect on learning of a combination of interest and attitude is found in an experiment by Levine and Murphy.⁸ Two groups, with five in each group, were selected on the basis of their attitudes toward Communism. Two passages for learning were then prepared, one passage being favorable to Communism and the other being unfavorable. The learner was first asked to read a passage through twice at his normal rate of reading. This was followed by fifteen minutes of informal conversation about other matters; then the subject was asked to repeat as accurately as possible what he had read. At weekly intervals for four weeks this procedure was repeated and the results scored. Then for five weeks the subjects attempted once a week to recall the material without reading it again. The results for the Anti-Communism passage are shown in Figure 20. The subjects who were opposed to Communism learned that material more accurately and forgot it less rapidly. Likewise the Pro-Communism passage was learned better and retained better by those favorable to Communism. Evidently, therefore, the students will be more successful in learning and in retaining

what they wish to learn but will be less successful in learning anything that they dislike.

One of the most significant and important differences between rote and rational memories is in the rates of forgetting. The more meaningful a given association is, the less likely it is to be forgotten.

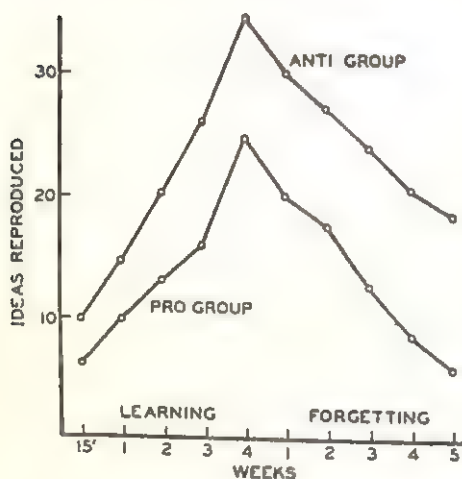


FIG. 20.—The effect of attitude on learning and forgetting. Material opposed to Communism was learned more readily and retained longer by individuals who were themselves opposed to Communism than by others who favored Communism. From Levine and Murphy (8). By Courtesy of the American Psychological Association.

Our most meaningful experiences happen only once, but are never forgotten. Some others happen often but are speedily forgotten. A young gentleman at a party is introduced three times to the same person and does not recognize the person on the third introduction. In such a case we can be sure that the person in question lacked interest and meaningful associations. One of the best ways to flatter a person is by remembering unimportant details about him. The pedagogical implication of this is that the more meaningful a given experience can be made, the more likely it is to be remembered, and the less the time and effort

required to learn it to a satisfactory degree of thoroughness. And the more we have learned, the more we can learn: "To those who have, shall be given; from those who have not, shall be taken away." If we know little, we readily forget that little because of the lack of associations.

A further and final characteristic of meaningful memory to be mentioned here is its greater probability of transfer. What we understand and are interested in is much more likely to be recalled at the time and place needed. It is generally recognized that we rarely use anything that we do not understand. A student may know a formula, but if he does not understand it, he is likely to use it in

the wrong place or to fail to think of it when it is actually needed. Since transfer is one of the chief things that we are aiming to obtain, we should accordingly emphasize rational as opposed to rote memory in dealing with most material that can be put on a rational basis.

The Field of Rational Memory.—As we get beyond the tool subjects, rational memory becomes increasingly important. In the sciences, we sometimes claim to place great emphasis on reasoning, but for the majority of the students certainly, and probably for all of them, the process of mastering the subject depends more on rational memory than on reasoning. The student does not ordinarily actually go through the process of arriving at conclusions for himself on the basis of evidence: he is presented with a readymade conclusion and with the arguments for it. This is true even in geometry, except in the case of the originals solved by the student. The text works out the proof and the student learns it: some by rational memory and some by rote memory. The same thing, in principle, happens in other subjects: the student accepts with more or less understanding whatever has been arrived at by others through a process involving original thinking. This is inevitable for the reason that successful reasoning is too slow and uncertain a process to be made the chief basis on which a subject is to be developed.

In proportion, then, as a subject is meaningful and rational, and emphasizes the relations between things, it is a proper field for the use of rational memory. This means that most of the social and natural sciences should depend mainly on rational memory. Some factual materials must be learned by rote memory, but the primary emphasis should be on a rational and meaningful understanding of the material presented. The same situation exists in literature and art. Some basic facts must be learned by rote memory, but the greater part of what is learned should have meaningful connections. Thus rational memory is of primary importance beyond the tool subjects.

We may interpret several of the modern movements in education as being primarily attempts to make educational content more meaningful, that is, to substitute rational memory for rote memory.

Both the fusion and the integration movements have aimed at the securing of meaningful wholes instead of relatively disconnected parts. The activity program has also aimed at making education meaningful, but it has attempted this more by way of introducing overt activities than by encouraging the development of ideas and consciousness of relationships. What is needed is not an attempt to treat everything in terms of one set formula of integration or of fusion, or of an activity project; rather we need an analysis of objectives and the adoption of methods suitable for each part of the program. The development of certain desirable results definitely requires rote memory methods; the development of other desirable results requires rational memory methods; and the development of other results requires still other methods.

Principles of Rational Memory Learning. Large Units.—Material to be learned by rational memory should be organized in large units. Only in that way will it be possible to bring out to the best advantage the broad relationships that are so important in rational memory. It will require considerable time and work to understand the causes of our Civil War, or the causes of economic booms and depressions, or the development of inductive scientific method. But when such topics have been worked out, the ideas involved are so interrelated that it is not difficult to remember them: each part seems to assist in holding the other parts.

The importance of large units and broad relationships should result in periodic systematic reviews, which, instead of simply repeating what had been done before, would use the opportunity to point out relationships that could not have been pointed out previously. At the end of a course, especially, it is important that a systematic survey be made of the developments that have, of necessity, been treated more or less in piecemeal fashion. This should lead to a final examination which—among other things—should encourage the student to make a final synthesis of the entire course. If the purpose of this review and examination is understood, it will be obvious that no excellent student should be exempted: the more intelligent, and the more industrious and interested the student, the

more profitable such a final synthesis should be. If any student is to be exempted from such a review, let it be the "D" student: he is unlikely to get much from it in any case and is more likely to forget anything he may learn through a short cramming process.

Use the Whole Method.—In verbatim memorizing by the whole method, a passage is read through from beginning to end, and the process is repeated until the passage can be recalled without assistance. When verbatim learning is not desired, the same general plan may be used and an entire chapter may be read through in order to get a view of the topic as a whole. College lecturers at times assist students in getting a general view of a lecture by putting an outline on the board or by giving out a mimeographed outline. Chapter summaries and tables of contents in textbooks may be used for the same purpose.

There are many variables here, and the results of different experimenters do not always agree; but generally in learning rational material there are sound reasons for using the principle of the whole method even if it does not always work. Rational memory, as we have noted, depends on relationships, meaning, and understanding. By studying topics as wholes, that is, by reading an entire chapter or even an entire book, the student has a greater possibility of getting a broad perspective than if he tried to master the same thing, paragraph by paragraph, or sentence by sentence. Of course, if the material is so difficult that he cannot read it without laboring over it in detail, he must wait until he has mastered it in detail before trying for the broad perspective. Obviously it will not be particularly profitable to dash rapidly through an entire chapter if at the end of it one does not know what he has read. Few students, for example, are able to read a text in higher mathematics and understand it as a whole: rather they must study it sentence by sentence.

Time Necessary.—Since rational memory depends particularly on the recognition of relationships, it is essential that time be allowed for reflection. Here we find another contrast between rote and rational memory. Rote memory seems to work best in short periods of intense concentration devoted solely to the associations to be

formed at the time. Rational memory involves a much more leisurely and time-consuming program. To be sure, we may read a book rapidly and concentrate on the relationships presented in the book itself, but if we wish to consider the implications of what we read, we shall find that inevitably our reading slows down.

Here interest will play a most important part in determining the final result. If interested in a subject we will think about it outside of regular office or study hours, and, in doing so, we may expect from time to time to note new relationships and meanings which add to our understanding, and at the same time, fix more firmly the memories in question. If, in contrast, we are not interested in a subject, we are likely to find that the time spent on it is not especially fruitful.

Make Type Studies.—If we are to emphasize large units and study them with any degree of thoroughness, we shall not be able to study everything. One of the desirable methods of meeting this difficulty is by making type studies. In order to understand the development of cities, we can take some typical city, such as Chicago, and study its development and life. To understand the anatomy and physiology of mammals we can make an intensive study of the cat. Chicago may not be quite like some other cities, but the student who studies intensively one typical city is more likely to get and retain the important points than is a student who deals superficially with many cities. Similarly the student who knows the anatomy of the cat with some degree of thoroughness has a better understanding of mammalian anatomy than does the student who has only a slight knowledge of many mammals.

Type studies do have, however, one important psychological disadvantage: they do not supply a satisfactory basis for determining what is really typical of the class to which the type belongs and what is peculiar to the particular case studies. For this reason it is important in making type studies to include comparisons and contrasts with other examples of the class. Only in this way can serious errors in concepts be avoided. For example, different cities have become great for somewhat different reasons: climate has been

a very important factor in the rapid growth of Los Angeles, but probably relatively few have moved from Iowa to Chicago for climatic reasons.

Emphasize Explanation.—The tendency to link cause and effect is one of the most important aspects of intelligent human thinking. We may, therefore, consider causation one of the most essential factors in building our intellectual conception of the world about us, and certainly it is a factor to be emphasized in teaching.

Among the most elementary principles of explanation is that of going from the known to the unknown, yet this is frequently disregarded—even by scientists. The ancient idea that the earth was flat, and that it was supported by an elephant at each corner, is an example of explanation in terms of the unknown. Psychological examples can be found in various hypotheses used to “explain” color vision. Hering, for example, accounts for the sensing of green and of blue by assuming anabolic, i.e., building-up, processes in the eye. This was done entirely without any foundation in the form of empirical evidence, and, what is much worse from a scientific point of view, it violates the accepted principle of the conservation of energy in that it assumes that a nerve stores up energy by doing work. This has about the same degree of physiological plausibility as the hypothesis that a man will rest his leg muscles by walking thirty miles in one day.

Good thinking and good teaching should avoid this error. If a child is to understand anything in a meaningful and significant way it must be by having the new idea linked up in an understandable way to something that he knows. It may well be that explanation is not possible until further knowledge is gained: in that case the attempt to explain should be abandoned until the foundation has been laid, or the necessary facts must be taught as a part of the explanation.

Explanation may take a number of forms and may occur at different levels. It may involve simply linking a series of events: a cartridge is placed in a rifle, the rifle is cocked, the trigger is pulled, an explosion follows, the bullet strikes the target—or misses. For

a more complete explanation, various aspects of this chain of events may be subjected to analysis. The mechanism of the gun may be taken apart to understand in greater detail that part of the chain of events. The gun maker will need to go further and study the properties of the steels used for the different parts. This may lead on to a study of physical chemistry. Similarly, to understand the explosion, we should need to study the chemistry of explosives; and to understand what the bullet does after it leaves the gun, we should have to study mechanics. In this case it should be clear that the level of explanation that is possible will depend on the level of intelligence and on the background of training of the persons who are to understand the explanation. An explanation may be correct and yet valueless to the person seeking understanding. In teaching, then, a level of explanation should be sought that is adapted to the intelligence and previous experience of the students.

Explanations tend to involve the use of general principles. Until a particular principle has been discovered, the search for an explanation will involve the discovery and formulation of the principle itself. After the principle is accepted, however, a particular case is considered to be explained simply by being classified under the general principle. When it is known that heat expands air and makes it lighter, the principle can be used to explain how a hot air furnace heats a house. Obviously, then, principles must be understood before they can be used for explanations, and since younger children will have difficulty in grasping many general principles, the possibilities of explanation are correspondingly limited. For this reason the teaching of the sciences in any serious way must be delayed until mental maturity is nearly complete.

Correlate Related Facts.—In many cases where cause and effect relationships are not clear it is possible to point out important concomitant variations. The increase in myopia with age may be noted as a fact of importance even if it be regarded as uncertain whether this increase is due to excessive close work, or to the hereditary form of the eye socket, or to some other factor. Such correlations may of course in time be further analyzed and more

fully explained. It is important for students to learn to seek out relationships, and it should be a useful mental stimulant for them to know that many of these relations are not well understood.

Relate Wholes and Parts.—First we should obtain a general view of a topic or subject as a whole, then analyze it into its parts. Next we should understand the relation of the parts to each other. This means that our knowledge should be analyzed, classified, and systematized. This is necessary if we are to understand complex structures and functions. An automobile is a complex structure of many different parts, each with a special function. The same is true of the human body, of a dramatic production, and of human society. If we do not understand the importance of certain parts of the whole, and how they are related to each other, our knowledge is to that degree ineffective. Garages have been called more than once to find out what was wrong with cars that would not start when the trouble was nothing more serious than an empty gas tank. Our economic system has for some time been functioning irregularly—which indicates that something is out of adjustment. Different diagnosticians, with different backgrounds and different axes to grind, have prescribed contradictory remedies: some favor increased production, some favor limiting production; some would increase exports, some would not. As a nation, we do not understand the relationships of parts of the economic system to the whole. Yet only through understanding it can we make it work. The same is true in other matters. If the student is to gain a functional control of the things he studies in school, he must learn to analyze and to relate correctly the parts of the whole. When he does this, he will find that he will remember more easily and will be able to retain longer and use more effectively what he knows. For rational memory, therefore, proper organization is a necessity.

Note Similarities and Contrasts.—Emphasis has long been placed on the importance of similarity and contrast in the making of associations. By noticing similarities and contrasts we may get a better understanding of material and also make it easier to remember. Furthermore, we have a strong tendency to classify things,

and classification is based on the perception of similarities and differences. If we meet a new member of a familiar family group and notice that some features are very similar to those of the members of the group whom we already know, we have no difficulty in remembering that individual in the future. However, in dealing with very similar members of a group, it is necessary to note differences and contrasts in order to distinguish them.

One of the most helpful procedures that the teacher can use is to relate things by noting likenesses and differences. This is a most useful way to review. Current material can be compared with what has previously been studied. In this way the students may get both a review and new insights.

Abstract and Generalize.—While the formulation of generalizations is ordinarily thought of as belonging in the field of reasoning, which is to be considered in the next chapter, the retaining of generalizations formulated by others is more properly in the field of rational memory. And in the course of ordinary class work, few generalizations are worked out independently by individual students, but the class as a whole may work out generalizations as called for in the Herbart-McMurray five formal steps.

Judd has emphasized the importance of generalization in connection with the transfer of training, and obviously, generalizations have a much wider field of application than individual facts can have. Many people had seen apples fall before the day when Newton formulated a generalization to cover both the fall of the apple and the movement of the moon around the earth—and then extended this to cover all other bodies. Little use could be made of the simple fact that apples would fall to the ground, but the general principle of gravitation has very wide applications.

One of the important practical reasons for generalization is mental economy. It would be impossible to remember all the specific facts that we encounter, but if we can formulate a general principle to cover many particular cases we can remember the one general statement and use it as needed to deal with the particular cases. Simply by remembering that water runs down hill we can avoid

the necessity of remembering specifically the course of the current in many streams and at many places. Furthermore, we can look at a map and plan a canoe trip with some confidence as to the conditions to be encountered on a given stream even though we have never seen that particular stream.

The capacity to abstract and generalize, we should bear in mind, is one of the most essential aspects of intelligence and is one of the last functions to reach its highest level of maturity. For this reason, in teaching at the earlier grade levels, less use can be made of generalizations. Algebra, as we have noted, is one of our most abstract and generalized subjects, and, as a result, it is one of the hardest to understand and to use intelligently. It is, of course, futile to have the student memorize by means of rote memory a generalization that he does not understand. Consequently, we need to qualify our statement and say that generalization will be useful somewhat in proportion to the intelligence of the students. For this reason it is important that the teacher avoid assuming too much maturity in the students. If the work is too abstract and too generalized for their level of intelligence, the results will not be satisfactory.

Use Suitable Tests.—Students will study for the kind of tests they expect to have to pass. If, then, we do not give tests that emphasize broad relationships, these will not be emphasized in study. Objective tests can be made to test knowledge of relationships as well as of facts, but it is perhaps somewhat harder to do this. Discussion questions of the essay variety are generally defective when considered as accurate measuring instruments, but they may be used effectively to encourage proper methods of study. Also term papers and other general essays are difficult to grade with any real degree of accuracy, and they are subject to the further difficulty that lazy and dishonest students can and do get other students to write papers for them, but, on the positive side, they encourage honest and capable students to organize and express ideas in a very valuable way. Consequently, although objective tests are of great value, they should not be used exclusively, unless it is impossible to give the time necessary to appraise essay tests and term papers.

Teach Students How to Study.—Since a major part of what students learn is learned by studying outside the classroom, it is obviously desirable that they use the best methods of studying. The teacher can contribute to this by making the right kind of assignments and by teaching students how to study. This latter problem will be discussed in Chapter 13.

Individual Differences in Memory.—It was formerly believed that individuals could be classified by imagery type and that particular individuals, for example, did practically all of their learning through visual imagery while others learned almost exclusively through auditory or motor or some other kind of imagery. Teachers were expected to make use of this in their teaching. The present view is that wide individual variations in imagery capacity exist in each sensory field, but that nearly all pupils have some degree of each kind of imagery. This means, however, that some pupils are so poor in visual imagery that they find it abnormally difficult to remember the appearance of a plant, a geometrical figure, a mineral, a map, or other visual object. Some have similar difficulties with auditory imagery and, as a result, have trouble with the pronunciation of a foreign language or with singing or with playing a violin. The teacher must expect to encounter such cases and to make allowances for them. Usually they find it necessary to formulate a verbal description of an object and to remember this verbal account rather than to remember the experience in concrete form. Geometry may be all but impossible for some otherwise intelligent students because they cannot remember the geometrical figures. At the other extreme are students with practically photographic visual memories, or students with such superior auditory memories for tones that they can reproduce long musical selections after hearing them only once.

There are also differences in memory associated with differences in age and intelligence. Apparently there is little permanent memory before the age of four or five, although superior children will usually remember more early experiences. In early years concrete

memories are relatively more important, and concrete memory continues to grow until early adolescence. After that time, symbolic imagery and memory tend to supplant the concrete form, and experiences tend to be remembered more in terms of language. This is associated with the greater capacity for understanding and remembering generalizations and abstractions.

Memory span increases with age, at first rapidly and then more slowly. The child of three can remember only about three digits after hearing them read once, whereas the adult can reproduce about seven or eight.

Learning capacity also increases with age. The idea is at times found that children generally learn more quickly than adults. Actually, however, the learning capacity of the child is increasing from infancy to maturity, with the result that the time and effort required to learn a given amount of material decreases with age. The young adult can learn harder things than the child can learn, and he can learn them more quickly. Much pedagogical effort has been very largely wasted because teachers have assumed that children could and would learn more than they were capable of learning. They are capable of learning a great deal, but assignments must be adapted to their level of development.

At first the child's understanding is very limited, and the material assigned for him to learn should be concrete and particular, simple, limited in amount, and not presented too rapidly. Also, more repetition will be necessary before satisfactory learning will occur. In contrast, the most intelligent young adults will be able to grasp abstractions and generalizations of a more complicated sort in greater amounts and will require fewer repetitions for mastery. The child who passes from the nursery school to the graduate school grows gradually from the lower level to the higher level.

This means that the teacher who is teaching children of any particular level should study very carefully the capabilities and the limitations of that level and keep the instruction within the level of comprehension and ability of the group who are receiving the instruction. Inexperienced college instructors very often make the

error of lecturing "over the heads" of their students and of presenting too much material too rapidly, especially for the students of below average ability. College graduates obtain positions as teachers in high schools and then proceed to use their college lecture notes to give courses to students in high school. Under these conditions it is hardly surprising that the results are frequently unsatisfactory both to the teacher and the students. However, the teacher who is clearly aware of the nature of the problem can by study of the reactions of the class arrive at a satisfactory level of teaching and of requirements.

A study of an intelligence test, such as the Stanford-Binet, may be very helpful in enabling the inexperienced teacher to get a clearer conception of what children of a given level may be reasonably expected to understand. This test shows, for example, that simple abstract terms are not commonly understood before about the age of twelve, that generalizations cannot be interpreted very well before about the same age and that the ability to formulate generalizations as required in the interpretation of fables does not mature fully until several years later.

Unless the teacher is careful at this point, material will be presented with the expectation that it will be understood and remembered on the basis of rational memory, but, being too difficult for the class to understand, it will be learned on the basis of rote memory if it is learned at all. Educators have long recognized this danger that students will learn by rote things they do not understand. They will parrot them back to the teacher hoping thereby to pass the necessary tests and they will then speedily forget the meaningless words.

To some extent this is inevitable: language cannot be used by the teacher in such a way that misunderstanding will be avoided, but serious errors can be reduced to a minimum.

Of course the teacher might make the error of pitching the instruction on too low a level, and that also is bad. The class will tend to resent it and they will not learn very much. However, with study and experience, a good adjustment to class level can be made.

ROTE MEMORY LEARNING

When do we use rote memory? We have already emphasized the point that traditional educational methods have been at fault in that they relied too exclusively on memorizing verbal materials without proper emphasis on understanding and without giving the pupils adequate motivation. It is most important, if learning is to be really effective, that these errors be corrected, but, on the other hand, we are not justified in going to the opposite extreme and concluding that rote memory or drill have no place in modern educational methodology.

In proportion as material does not follow rules or "make sense" it is necessary to learn it on a rote memory basis. Spelling is partly phonetic and can be spelled on the basis of sound, but in the English language there are many exceptions to phonetic spelling and it is necessary to learn these exceptions by rote.

Furthermore, the spelling of common words needs to be so mechanized that the spelling is automatic. When this is the case, even if there is a rational basis for memory, it is practically necessary to use rote memory methods for best results. This latter situation is found with reference to combinations in arithmetic. There is a rational basis for combinations such as *nine plus seven equals sixteen*, but when we are adding a column and encounter the combination of 9 and 7 we do not want to have to stop and reason it out—we want to think 16 automatically. The same is true of many other things. Dates in history, formulae in the sciences, vocabulary in foreign languages, and precise factual materials in general may have a more or less rational basis, but when these things are frequently used and must be exact, it is ordinarily more efficient to learn them by rote memory methods.

Wilson, for example, divides the teaching of arithmetic into three phases: appreciation, problems, and drill. On the latter he comments as follows ²⁰ (p. 332):

Drill is the proper method for 100% mastery of addition, subtraction, multiplication, division, fractions in halves, quarters, and thirds, and a reading knowledge of decimals. Book, Thorn

dike, et al, have shown the superiority of drill for the development of skills. . . . Drill can be good teaching, the best of teaching for certain types of material. Drill can be motivated; it can be challenge and fun under a good teacher. Drill should always be kept well behind meaning and motivation, and it should be adapted to individual abilities. There should be no pressure or threatening accompanying drill. If a drill task is appropriate for a child, if need has been developed through usage in meaningful situations, the child can be led to set his own tasks and do his own checking. The teacher's task is to guide and then stand by to help.

PROBLEMS AND METHODS

Motivation.—In the quotation from Wilson it was pointed out that motivation should be developed before resorting to drill. This is most important. The average child, or adult either, does not like to do the work necessary for mastering rote memory material unless he has been convinced of its value. If, however, he can see that it will contribute to the attainment of his objectives, and consequently to his self-enhancement, he will be ready to work hard in order to master difficult tasks.¹⁴ This should not be too difficult if the curriculum maker has selected materials that are properly related to the needs of the pupils; but if the curriculum is obsolete, it may not be possible to develop proper motivation.

The average child desires to be proficient in his daily adjustments and if he is made to see that correct spelling, computation in arithmetic, and knowledge of certain frequently encountered facts will be of value to him, he will be willing to work within the limits of his capacity.

Part Method.—A decade or two ago it was customary to say that the whole method of learning was better than the part method. Further experiments have shown that this is not universally true. In general the whole method is better when the material involves many rational associations *and* when the learner appreciates these relations. If, however, the material does not involve rational associations to the learner the whole method loses its superiority. Also, when there are rational associations, the part method appears to

be better if the separate elements are usually to be used independently. Consider, for example, the multiplication tables. Formerly it was customary to learn these as wholes. Then when a pupil had a problem in multiplication to do which involved the combination 5×7 he might have to begin at the first of that particular table and go through it up to the combination needed. What is wanted obviously is the ability to think instantly 35 when that particular stimulus is presented. So it should not be surprising that experiments have shown the part method better in acquiring this particular kind of mental connection.

At the present time it appears that the best way to learn to multiply is through practice in multiplying. The pupil takes a problem in multiplication and starts to work. When he encounters a combination he does not know, he gets that combination by looking immediately at a printed multiplication table which he has ready at hand. There is no introspective reference to a learned table, nor is there any counting on the fingers. When he can think the combination at once he does not look at the printed table. In this way, by doing many problems, he learns the combinations through direct use. This means that each combination is learned as an independent unit, rather than as part of a logical whole.

Because experiments have indicated the above method to be the best, some students have argued that the multiplication tables should not be learned at all. This, however, is not necessarily a valid deduction. There will be times when errors will be made on multiplication combinations: through a slip in memory 7×8 will be turned into 54 or some other incorrect number. Here it should prove useful to think of this particular combination in relation to the table as a whole, and more especially in relation to 7×7 and 7×9 . A knowledge of the tables should prove useful, but it is not the best basis for developing skill in multiplication. The fact that the tables have been learned as a whole should not interfere with the development of skill in the use of the separate combinations.

To summarize: It appears that when rational relationships are important in our thinking, we should emphasize these in the learning process; but when we need to be able to think quickly of certain

specific associations it seems better to learn these independently, that is, it seems better to use some form of the part method.

Recall and Recitation.—From time to time we have emphasized the principle that things should be learned as nearly as possible in the way in which they are later to be used. Since it is desirable that we be able to recall most of the things that we learn, this means that we should practice recall. Simply by reading things over it may be possible when they are encountered again to recognize them as correct, but they must be known more thoroughly in order to recall them. This distinction is recognized in the construction and use of objective tests. Some of these are called recognition tests because all the student has to do is to recognize the correct answer out of several that are given. Others are called recall tests because the correct answer is not given and so must be supplied by the student. Multiple choice tests are usually recognition tests, while completion tests are recall tests. Other things being equal, the completion test is therefore a better test of thorough knowledge of factual material than is the multiple choice test. Other tests can be used which also require the student to recall the necessary answer. Questions can be given that can be answered in one or at most a few words. If students learn to expect such tests, they will tend quite naturally to study for them, that is, they will practice recall.

Distribute Repetitions.—Simple repetition without effort to learn is generally considered virtually valueless. It is not repetition as such that is important, rather it is the character of the activity during repetition. Yet repetition is necessary in learning rote memory material. Cases have been known of individuals who could repeat as many as forty digits after one reading, but most people would find this an impossible task. It would be necessary for them to repeat such a series many times in order to learn them. For the greatest efficiency these repetitions should be distributed over a considerable period of time. It is usually held that during the period of learning, the repetitions should be closer together, then, after the material is fairly well learned, it should be reviewed at intervals

but with the time between reviews increasing. At first the reviews might be daily, then weekly, then monthly, then a general review at the end of the year. When practicable, a review at the beginning of the year would also be in order.

As related to teaching, this means that it is virtually impossible to teach rote memory material in a lesson in one day and get students to remember it without review. If, however, the time is distributed and the material is reviewed from time to time, satisfactory results are possible.

One of the implications of the distribution of repetitions is that the practice periods are to be short, and, in general, the younger the children, the shorter the periods will need to be. Some teachers have obtained excellent results by using a three- or four-minute period at the beginning and at the end of a class period for drill and have used the rest of the period for other purposes.

Correct Errors.—Because of the fact that rote memory material in its very nature lacks logical connections, it is singularly easy to retain and fix incorrect connections. For this reason it is especially necessary here to locate errors and correct them. Reed¹³ has effectively stressed the principle that applications are to be at the point of error. Since errors are largely individual affairs, this makes it necessary to locate individual errors and use methods that will encourage each person to correct his own mistakes. This is now being done particularly in some of the elementary school subjects. Morrison, as indicated in Chapter 5, has stressed a formula that is applicable here. First give a pre-test to find out what students do not know. Second, give such instruction as is needed to remedy the deficiencies discovered by the test. Third, give another test to determine how well the deficiencies have been corrected. Then continue this procedure of teach and test until a satisfactory degree of thoroughness has been attained.

In arithmetic, for example, this situation is met by having tests, practice exercises, and final tests that the student can use individually. In this way different pupils in a class, with different difficulties, can be working on different things at the same time without

requiring a great deal of attention from the teacher. Although printed materials are not yet available in all subjects, the teacher who is alert and recognizes the need can go a long way in the direction of locating and correcting individual errors in any subject.

Dunlap's Gamma Hypothesis.—Generally we have had the idea that practice of any connection tended to establish it. Consequently teachers have believed it bad for students to be exposed to error in any form. Many teachers have objected on this account to the use of true-false tests: they were afraid that the presentation of false statements would tend to develop and establish errors. That this is not necessarily true is shown by experimental evidence, and an experiment by Dunlap gives us a better understanding of the whole problem of error. Dunlap had experienced some difficulty in writing the word "the" on a typewriter. Because of an error in timing he wrote "hte." This persisted until finally Dunlap began deliberately to practice writing hte, hte, hte, and so on for many repetitions, but with the conscious emphasis that this is the incorrect spelling. In this way he mastered the error as an error: it was forced into his consciousness that this was the wrong way to write t-h-e.

This principle has been extended to other undesirable responses. Some cases of stuttering have been cured by having the stutterer practice stuttering voluntarily with the objective of developing voluntary control of the stuttering so that when he was disposed to stutter he could voluntarily assume control and refuse to stutter. Basically the idea is to get control of the error with the clear recognition that it is an error. When this occurs, it becomes possible to inhibit the error and make a correct response.

This principle has an important pedagogical application: since errors cannot be avoided, they must on occasion be mastered as errors. Then they can be avoided. From this point of view, true-false tests may be most important educational devices: they may give valuable assistance in getting the student to recognize certain errors as errors. In any place where errors occur, it may be desirable to master them thoroughly *as errors*.

Mnemonic Systems.—Rote memory material is, as we have noted, singularly hard to learn in any quantity in a short length of time, and some rational material, because of its lack of rationality to the individual concerned, may approach in difficulty the non-rational content. It is, therefore, not surprising that much ingenuity has been exercised in attempts to overcome this difficulty. Various complex systems of associations have been used to assist in retaining material that otherwise could not be retained. The basic idea is to link the difficult rote memory content to something much easier to remember. Suppose, for example, a person has difficulty in remembering dates in history. He wishes to be able to remember that the Turks captured Constantinople in 1453. Letters can be used to represent numbers: a for 1, b for 2, c for 3, and so on. On this basis 1453 becomes adec. But adec may be about as hard to remember as 1453, so in order to remember that sequence of letters we make up a sentence of four words beginning with the letters a, d, e, c, in order. Such a sentence would be "Alimony does encourage caution." If, then, one can remember the sentence in connection with the historic exploit of the Turks, he may be able with some diligence to dig out 1453 as the desired date.

Two important conclusions stand out with reference to the use of such systems: first, they are awkward and time consuming and are not suitable for general use in learning a mass of material; second, they may have some value in remembering particular facts that otherwise seem difficult to recall when needed. Consequently it does not seem wise for the teacher to make extensive use of such devices, but if something is really easier to remember through being given some artificial linkage, there can be no valid objection to the restricted use of such devices. Like crutches, they are to be avoided, but if really necessary, it is wise to use them. However, it is well to recognize the fact that such artificial associations may persist as mental *impedimenta* long after the occasion for using them has passed: they cannot be discarded quite as readily as can a pair of crutches.

Individual Differences.—Very wide differences in the ability of students to learn rote memory material will be found. Under ordi-

nary conditions this is likely to result in fairly good mastery of the material by the better members of the class but with progressively less mastery by the less able members of the group. To avoid this result, the best method would appear to be through making different requirements of students of different degrees of ability. Have the slower students learn only the essentials, but learn those well. Have the better students learn more. If this is not done, the better students may be released from the regular class work and permitted to do special library work or engage in any other desirable project. For some students this free time could best be used for bringing up deficiencies in other subjects.

Rote memory is not closely correlated with intelligence. Consequently some students of high intelligence and generally high scholastic achievement will be found defective when it comes to the mastery of such things as spelling, arithmetic tables, and facts in other subjects. In one instance a major student in English was rated by a college instructor as ranking exceptionally high in literary appreciation but as being one of the poorest spellers in the group of advanced students. Some of these people simply say that they cannot learn that kind of material, and having thus settled the issue, they make little further effort to correct their deficiencies. These students should be told that although they may have to work harder than some other students, they can nevertheless learn all that it is essential for them to learn. Very often the greatest difficulty here is to get the student to do the necessary work. Some of the students who learn most things easily lack the habits of self-control and industry without which they will not do the systematic work that is required in this case. Consequently they may fail quite as much because of lack of effort as because of lack of ability.

Another difference, about which we know very little, but which would on some occasions be very important, is variation in specific associative capacities. In the cerebrum there are fibers that connect the various areas of the cortex. For example, the auditory area is linked with the visual area; and each of these is linked with the kinaesthetic area. Also, since nerve fibers conduct impulses across synapses in only one direction, there must be one set of fibers con-

ducting impulses from the auditory to the visual area, and another set conducting impulses from the visual to the auditory area. Furthermore, since variations occur in almost everything that we have been able to measure, it seems probable that there would be wide variations in the anatomical structure and in the physiological efficiency of these various tracts in some individuals. Thus a person might be able to link a visual stimulus with an auditory response but might not be able to make the reverse connection of an auditory stimulus with a visual response.

The foregoing assumptions may not be correct as to the details of cortical function, but when used as a basis of treating certain difficulties in reading, successful results have in some cases been obtained: nonreaders have become readers. For example, cases have been reported in which children who failed to learn to read in the normal way have learned to read effectively by making use of an indirect set of associations. Printed words have been associated with motor responses, and motor responses with auditory reactions, with the result that where the child did not previously get word meanings, he did get them under the new system. If, therefore, the association fibers between the visual and auditory areas do not function in such a way that the child can react to the printed symbol "dog" by thinking the sound "dog," this result may be obtained by having the visual symbol associated with the response of printing "dog" on paper, or on the board, and then associating this motor response with the proper auditory response. Not all cases respond to such treatment, but some do. This is what would be expected if there are variations in fiber tracts as assumed. In any case, however, and whatever the explanation, we do find wide individual variations in success in making different kinds of associations. And one of the functions of school psychologists in the future will be to make careful analyses of the specific defects and strong points of individual pupils in order that they may be given proper training.

Application to Special Subjects. Spelling.—In order to indicate more specifically the application of rote memory principles to teaching, we shall consider briefly the teaching of spelling and of foreign languages.

As previously noted, our first concern in the teaching of spelling is to have a restricted spelling list of the most frequently used words. This list should not exceed 500 words per year. This gives us an average of about three words per school day.

In order to master these words it is necessary that they be studied and reviewed over a period of time. One method would be to assign a list of thirty words to be mastered in a period of two weeks, with short drills daily for that period. Individual records should be kept of words missed, and special attention given to the correction of such errors. This may be done by having spelling books with places for recording errors, or it may be done by having the pupils keep individual lists in a record book.

After the two weeks used for the original drill on the words, there should be periodic reviews with primary emphasis on those words causing the greatest difficulty. This would mean then that the effort during any given period would be given to review as well as to teaching new words.

In an experimental study of spelling by Stegeman,¹⁶ it was found that children in the fifth grade could learn to spell a list of words in from 10 to 20 seconds per word. They varied greatly, however, in their retention of the words learned. Some showed evidences of forgetting in as little as 30 minutes while others would remember the list correctly for as long as 10 days. This difference in rate of forgetting seemed to be most important in determining success in spelling, and for that reason teaching methods were adjusted to differences in forgetting as determined by actual test. Those children who forgot words quickly would at first review them daily, then weekly, then monthly, while those who forgot slowly could omit the daily reviews.

For real efficiency it is most important that particular attention be given to errors in spelling in the regular written work. For best results the teacher should keep a written record of errors in the spelling of common words by individual children. This can be done most conveniently on a single large sheet of paper with a space for each pupil. These words will provide a list for special work.

One special problem in spelling has to do with reversals of letters within a word, and with reversals of all the letters in a word. Thus "church" may be spelled "chruch" or "cat" may be spelled "tac." There are wide differences of opinion among psychologists as to the causes of such spelling. One theory attempts to explain such reversals by linking them with left-handedness or with lack of the normal dominance of one eye and one hemisphere of the brain. A simpler explanation of some at least of these cases is, however, possible. Associations may be either simultaneous or successive. Words tend to be read as wholes, that is, all letters are perceived simultaneously—without time succession. But when we ask a child to spell a word we ask him to give letters in an order that involves a particular time and space succession. He may know all of the letters in the word, but he may not have given attention to the problem of order. This means that the problem of spelling requires emphasis on serial or successive association as opposed to simultaneous association. It might well happen at times that reversals will be associated with left-handedness, but they also appear in connection with right-handedness. After all, both right- and left-handed people are able to move in both directions.

Adults are sometimes inclined to assume that children can, without assistance, analyze words into their phonetic components, and that this should be a guide in spelling. In many cases, however, it appears that children simply fail to make any meaningful association between the sounds of the elements of a word and the arrangement of the letters. When this is the case, it is quite as logical to spell "cat" "t-a-c" as it is to spell it "c-a-t." So while reversals can usually be corrected by sufficient drill, it would usually appear wise to attack this problem as one involving the development of a sense of successive associations for sounds and associated letters.

Rote memory is affected by factors affecting the general condition of the nervous system such as fatigue, loss of sleep, fever, sleepiness, and drugs—both narcotics and stimulants. Consequently it is to be expected that errors in spelling will be affected by such factors. Reversals will occur more frequently as a result of depressive factors and less often as a result of mild stimulants. Although there is very

little that the teacher can do to improve memory through such factors, a knowledge of their effect will be of some value in interpreting variations in pupil performance.

Memory in Foreign Language Study.—For centuries the major part of the teaching of foreign languages seems to have been on a grammatical basis. This means that the effort has been made to have students learn languages through the use of rational memory and deductive reasoning. For the most part, however, such teaching has been unduly time consuming and inefficient. Better results could be secured through the use of more direct memory methods. Few contemporary teachers of foreign languages would consider teaching their subjects to a group of imbeciles by the conventional grammatical method, yet all languages have been spoken by imbeciles, and our American imbeciles could learn to speak any language that is taught by direct nongrammatical methods. In this case the primary emphasis is placed on rote memory and almost no use is made of deductive reasoning. The students get a "feeling" that certain things are correct instead of learning grammatical rules to cover the situation.

In order to learn a foreign language most economically we need first a vocabulary list similar to the Ayres list of the one thousand most common words in English. Probably this list translated into a foreign language would not be far wrong as a basis. For those with special interests, such as travel or commerce, a limited special vocabulary would, of course, be required as a supplement. A language text could be made up containing conversational expressions for special drill and stories starting with an easy vocabulary and gradually increasing in difficulty. At first an interlinear translation might be supplied, with perhaps a few explanations in footnotes. After a word had been used a number of times—the best frequency to be determined by experiment—this word would no longer be translated, but instead the meaning would be given in a footnote. After some additional number of times—this frequency also to be determined by experiment—a footnote would tell the reader to look back to footnote 3 on page 16. In this way the student would be

reminded that he was expected to know the meaning of that particular word. After a few reminders of this kind, no further assistance would be given on that word. Each new word would be translated at first and, after going through the same treatment, would finally appear without translation.

In using such a text, the teacher would, at first, read aloud a great deal, or use sound recordings, so that the pupils could develop accurate auditory imagery for the new sounds, and also so that the pronunciation could be associated with the printed words, as suggested in the last chapter. This is not only an essential aspect of knowing a language but the association between sounds and visual images makes it easier to remember both.

In following this method the student reads any given selection as many times as necessary to master it. Sufficient mastery would be indicated when he knew the words without looking at footnotes for the meaning. Then he would go on to the next selection. Good students would progress very rapidly and would read many books in a school year. Consequently the cost of books would be much greater the first year such a program was started, but afterward the same books could be used without additional expense.

The use of translations has been condemned by many language teachers and recommended by others. When properly used, translations can be of great value in acquiring fluency in reading. By first reading a passage in English to get its meaning, and then reading the same passage in the foreign language, many errors of interpretation can be avoided, much time can be saved, and at the same time greater ability in rapid reading will be acquired. This practice also tends to reduce the tendency to develop what is known as "translation English."

After a good foundation has been gained in the use of a new language, some attention might be given, for the better students at least, to the grammar. This would mean that present practices would be reversed: grammar would be for the more advanced students rather than for the beginners. Experiment probably would show that the less able students would not profit sufficiently from this grammatical work to justify the time spent on it.

OTHER SUBJECTS

While it is true that each school subject has its own special problems, certain fundamental principles relating to the use of rote memory are the same for all subjects. The material to be learned must be restricted to what will be frequently used; otherwise it will be forgotten. Exercises should be devised that will permit the students to learn this material in a graded series of steps with adequate practice on each part. Frequent reviews will be necessary. Older students are more likely to raise objections to such reviews, but they are essential for adults as well as for children—if rote memory material is to be retained. When rational associations can be made, they should ordinarily be made, but this, of course, takes such material out of the rote memory classification.

Even in subjects in which most of the subject matter is of a rational character and in which the teacher may wish to use a teaching method that places primary emphasis on understanding, very often there will be some factual material of such a character that rote memory methods are desirable to produce the thoroughness without which efficiency in use will not ordinarily be attained; or, to state the matter in a different way, rote memory methods are necessary to increase the probability that factual material will transfer readily to appropriate situations.

QUESTIONS AND EXERCISES

1. How are memory and thinking related?
2. In what sense is memory the basis of imagination?
3. Distinguish between rote memory and rational memory, and give original examples.
4. How does memory capacity change with age up to maturity? What bearing do these changes have on methods of teaching?
5. What are the different ways in which the ability to memorize may be increased?
6. Describe the curve of forgetting. How can the rate of forgetting be reduced?
7. Why emphasize large units in learning rational memory materials?
8. What are the psychological values of reviewing for final examinations? Why should good students not be exempted?
9. How do classroom tests influence the study habits of students?

10. What are some of the more important individual differences in memory?
11. Give examples of materials best learned by rote memory.
12. How would you explain the learning that takes place in agreement with Dunlap's Gamma hypothesis?
13. What are the chief values and limitations of mnemonic systems? Give examples of their legitimate use.
14. Describe the application of memory methods to the learning of spelling.
15. How would you modify your teaching methods in teaching memory materials to bright and to slow classes in the seventh grade?

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CHAPTER 8

THE TEACHING OF REASONING

Contemporary educators tend to place a great deal of emphasis on teaching students how to think. Some seem to consider this the most important single goal of higher education, and even in the elementary schools the trend has been away from an emphasis on the learning of facts and in the direction of an emphasis on a problem approach. It is consequently important that the teacher understand the psychology of thinking and its applications to teaching procedures.

Problems may be solved in several different ways. These include trial and error, testing and experimenting, and reasoning. An animal placed in a cage will paw or gnaw around the door; he will pace back and forth; and he may try to pull or push the bars apart. If, by chance, he makes the correct movements and unfastens the latch that holds the door, it is likely to take several chance repetitions before he learns to open the door immediately. A man placed in a similar situation would ordinarily examine the fastening and then open the door directly without wasted effort. If, however, the man were placed in a cage with a more complicated fastening mechanism he also might be reduced to trial-and-error behavior. In other words, trial-and-error behavior attempts to solve problems when the problems are not understood.

At a higher intellectual level, problems may be solved by tests and experimentation. In this case, if the individual who has a difficulty is not able to solve the problem by mental analysis, he plans and carries out tests of various kinds to answer his question. If an engineer wishes to know the tensile strength of a wire, he may load the wire with more and more weight until it stretches and then breaks. In this way he determines by test the answer to his problem. Considerable intelligence, ingenuity, and knowledge may, however,

be involved in making experimental tests to answer problems. The chemist who tests a specimen of ore to determine its gold content is using knowledge to answer his question. The small child may deliberately test out his parents to find out what they will do when he performs in certain ways. Such experimentation and testing are common in human experience. A large part of what we learn about natural and social laws is learned by such experience. At the highest levels of experimentation we have the carefully planned and executed experiments of trained scientists. These may be based on a great deal of technical knowledge and may require the use of complex scientific instruments.

On a more purely intellectual level, problems may be solved by the process of reasoning. In this case the operations are essentially mental, although use may be made of such operations as writing and the making of calculations on a slide rule or calculating machine. In such instances mental analysis takes the place of manual or other motor operation.

The Nature of Reasoning.—Reasoning is a process of controlled thinking or association which starts with some problem of interest to the reasoner and is directed toward its solution. It differs from ordinary imagination in that the results of reasoning are supposed to check with some outside criteria, that is, they are supposed to be correct while such checks are not necessarily required in imagination.

There are two different kinds of reasoning, inductive and deductive, although both processes are often very closely interrelated in a given instance of thinking. Inductive thinking attempts to work out a general rule, explanation, principle, or idea to explain or cover a group of particular cases. Much scientific research is of this type. The still unsolved quest for the causes of cancer is a case in point.

Such researches begin with a problem. The known facts are examined and analyzed and some hypothesis is advanced as a tentative solution. Particular cases of the thing studied are then examined and compared. If the study is successful, some general rule or explanatory principle is formulated to cover the individual cases.

As an example of problems that require inductive thinking for their solution we may take two series of numbers:

A.	5	10	15	20	25	—
B.	1	4	9	16	25	—

The problem here is to complete the series by filling in the blank with the correct number. Simple inspection indicates that the first series is made up by counting by fives. We may then apply this rule and fill in the blank with the number 30. The second problem is more difficult, but an analysis will show that the series is made up of the squares of the numbers 1, 2, 3, 4, and 5. Consequently the next number should be the square of 6. And so the answer sought is 36.

In this, as in other cases of induction, we look for similarities and relationships between individual cases and attempt to formulate a generalization that will cover the group.

In somewhat the same way, as has been pointed out in Chapter 6, the child is forced to make use of induction in formulating his concepts and developing his understanding of words. For example, in formulating the concept of "dog" a comparison is made of different dogs, and by a process of abstraction and generalization a general idea or concept is developed which seems to fit all dogs but which excludes other animals such as cats and monkeys. These early concepts are, of course, not very exact and are subject to revision with further experience.

Not only are valid general principles and scientific laws arrived at by induction, but false ideas, such as superstitions, were probably originally arrived at by observing individual cases and making generalizations on the basis of those cases. The superstition that 13 is an unlucky number probably originated with some actual case or cases where misfortune was associated with that number. Our many superstitions indicate that it is very easy to arrive at false generalizations through induction. The careful experimental methods of science have been devised largely for the express purpose of reducing the probability of such errors.

Deductive thinking starts with some accepted general principle and applies it to a particular case. Consider the syllogism:

Major premise: All men are mortal.

Minor premise: John Doe is a man.

Conclusion: Therefore, John Doe is mortal.

The principle that "All men are mortal" is assumed to be accepted. Consequently, if "John Doe is a man," it naturally follows that "John Doe is mortal."

As we grow older we acquire many general principles that we accept. Some of these come from our own inductions; some come from our studies in school; some come from our parents and other associates; and some are picked up more or less unconsciously from our environment without our knowing exactly their source. Many tastes and prejudices are tied up with general ideas which we use in settling problems that arise in our daily experience. Largely because of this fact, deductions that are logically correct, so far as the thinking process itself is concerned, may lead to false conclusions.

In the arguments offered in school and in daily life many deductions are made without an explicit statement of the premises and fundamental assumptions. As a result, many disagreements are based fundamentally on the acceptance of different premises. Those, for example, who consider social training and adjustment to be of primary importance are likely to favor co-educational schools and colleges, while those who consider intellectual efficiency to be of primary importance are likely to favor separate schools for the sexes. When deductive arguments are based on such different assumptions, there is usually very little hope that the debaters can be brought to an agreement.

Error in Reasoning.—Although it is not possible here to furnish satisfactory proof, the statement is submitted that, when conditions are quite novel and complex, our reasoning, in a large proportion of the cases, leads to false conclusions. Such a conclusion will not appeal to human vanity but is in line with the available facts. In the history of science, many false conclusions have been presented only later to be disproved and forgotten. If we present a fairly simple

problem in arithmetic or algebra to an ordinary class of college students in some subject other than mathematics, we shall generally find that many errors are made. In the problem stated below, for example, only about 10 per cent of an ordinary college group will get the correct answer.

A golfer made a very long putt and was so pleased that he decided to measure the distance. He did so with an ordinary cloth tape measure and found that the putt measured exactly forty feet. Then he discovered that the tape measure had stretched so that each inch of the measure was one-eighth of an inch too long. How long actually was the putt?

In the majority of cases the answer found for this problem will be about 35 or 36 feet, but the correct answer is 45 feet. The fact that the tape measure has stretched seems to suggest to most readers that the resulting measurement is too long. Actually each of the measured 40 feet represents $\frac{7}{8}$ of a foot so that the true distance is found by multiplying 40 by $\frac{8}{7}$.

Students do fairly well in working problems in arithmetic or algebra when all the problems on a page are very similar and when a sample is worked out at the top of the page; but when a page of problems involving different principles is given, and the correct process to be used must be determined, even the good students make many errors.

A familiar example of error in reasoning is found in current interpretations of the causes of business depressions. A variety of conflicting interpretations is given. None of them may be correct, but, since they disagree, not more than one can be entirely correct. The failure of professional economists to agree on a diagnosis of the difficulty is then in line with the position taken here. Similarly we find a conflict of judicial opinion even in that able group, the Supreme Court of the United States, which too often settles cases by a five to four vote. Also in medicine, we find violent conflicts in diagnoses and in treatment: one physician says remove the tonsils, the next says it is better to let them stay in. Also in other fields: the experts do not agree when they are dealing with novel and

complex problems. If the experts fail in their special fields, what can we expect of the average citizen?

We shall not labor the point further, but the student is invited to observe closely and note the great frequency of errors in reasoning both in school and out. This is a point of great importance in teaching subjects that are commonly said to involve reasoning.

Reasoning versus Rationalization.—The Freudians have emphasized the point that a great deal of what passes as reasoning is not, in reality, reasoning at all. In true reasoning, we are seeking the truth and we do not know the conclusion when we begin the reasoning process. Yet it often happens that we use our intelligence and our experience, not to find the true answer to a problem, but rather to defend an answer that we *wish* to have accepted. This process of defending our wishes and prejudices has been called *rationalization*. The great frequency of rationalization is, incidentally, another reason for saying that what we commonly call reasoning only infrequently leads to correct results when dealing with novel and complex problems. We are very likely to accept any solution that pleases us. We notice and remember such evidence as agrees with our wishes and preconceived opinions and tend to ignore or to minimize and forget anything that fails to fit in with our ideas.

Age Differences in Reasoning.—We sometimes hear it said that young children cannot reason. This, however, is not correct. Reasoning is involved, as we have already pointed out, in the formation of the thousands of verbal concepts which the child already has. Although there is some disagreement among psychologists as to the reasoning abilities of children at different ages, the general outline of what takes place in the growth of reasoning ability is fairly clear. Ability to reason is essentially the ability to see relationships. This begins at the lowest level with the ability to see the simplest relations between concrete things. Hens, although notably lacking in intelligence, can learn that they are permitted to eat only from the grain placed on the darker of two pieces of paper, but it takes several hundred trials for one of them to learn this simple relationship. Apes placed in a cage with bananas suspended out of reach will pile one box on another one so that they can climb up on the

boxes to reach the bananas. This is an effective solution of a simple concrete problem.

The growth of reasoning ability involves growth in several respects. More complex problems can be solved. Less obvious solutions can be worked out. A more objective outlook is possible in the approach to a problem. This means that bias and prejudice and personal considerations may have less weight in determining the conclusion. There is an increase in capacity for understanding and for formulating abstractions and generalizations. There is an increase in the capacity for understanding and for using language and symbols in the solution of problems.

On the basis of Binet test norms and the researches of Piaget and others it seems that at about the age of 11 or 12 years the normal child really begins to understand abstract words and to understand generalizations.^{11,14,19} Young children may have a limited understanding of rules, but they apply them mechanically and without allowances either for exceptional conditions or for differences in the individuals concerned. In this sense they are absolutists: they accept the letter rather than the spirit of rules. With increasing age they gain in an understanding of the real meaning of rules and general principles and consequently are more able to make allowances for variable conditions.

The small boy who has accepted the rule that the family must come to the table promptly for dinner is unable to understand that his father may be justified in being late on certain occasions. For this reason, when children act as judges and determine penalties for children who have been guilty of offenses, they are not likely to be as lenient as adults.

The best available evidence indicates that intelligence continues to grow until physical maturity is reached, or until about the age of 20 years. This suggests that the fullest capacity for reasoning is not reached until about this same age and that consequently the most difficult problems should be postponed until the college level.

Sex Differences in Reasoning Ability.—Although the sexes seem to be about equal in general intelligence, there are some sex differences in reasoning ability in particular fields. Boys are better

in solving problems in arithmetic and in higher mathematics, and in solving problems in other fields such as physics and chemistry which require the use of mathematics. Nearly all patents are taken out by men, and this fact, plus evidence from tests of mechanical ability, indicates that males are on the average better than females in solving mechanical problems. Girls and women should be rela-

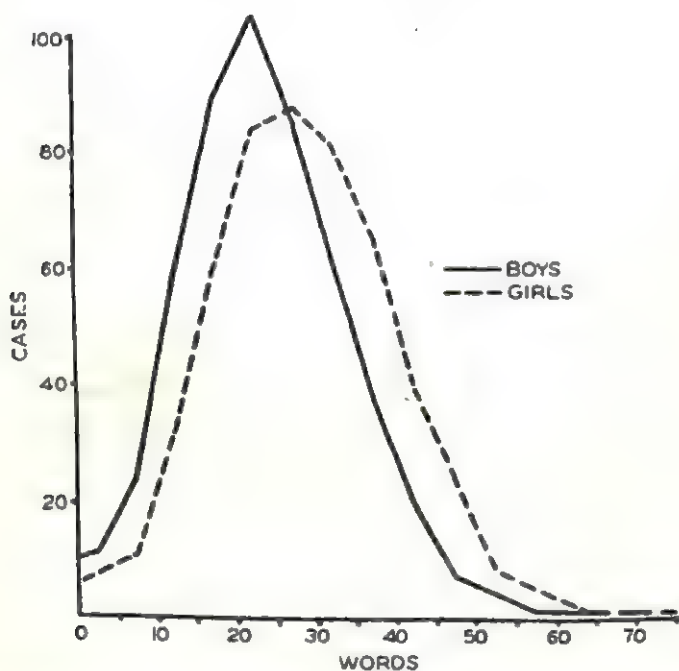


FIG. 21.—The distribution of the scores of college freshmen on a test of artificial language. Based on 514 girls and 716 boys, but the distribution for the boys has been reduced to 514 cases by reducing ordinate values to .718 of the original. Both distributions have been smoothed. Ellis, R. S., *Psychology of Individual Differences*, p. 266.

tively better in solving problems growing out of social situations, but we do not have tests which would make it possible to secure a fair comparison in this field. However, a good comparison of the sexes at the college level for two different abilities may be had from scores on an early form of the American Council Psychological Examination which included a test on arithmetic problems and one on artificial language. Both tests required deductive reasoning, but

they were in quite different fields. The results for one group of college freshmen are shown in Figures 21 and 22. The average score for the boys is higher on the arithmetic problems whereas the average score for the girls is higher on the artificial language test. Boys showed more ability in analyzing numerical relationships whereas girls showed more ability in understanding and in applying a set of rules for making a new language.

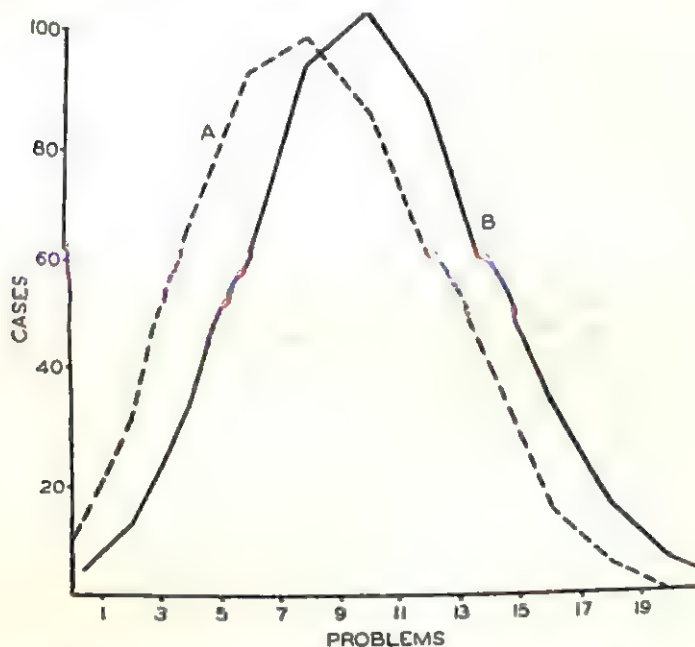


FIG. 22.—The distribution of the scores of college freshmen on a test of arithmetical reasoning: A. girls; B. boys. The distributions have been adjusted and smoothed as in Figure 21. Ellis, R. S., *Psychology of Individual Differences*, p. 265.

SOME PRINCIPLES OF TEACHING REASONING

Teach Problems.—Since reasoning starts with some unsolved problem, we must, if we wish students to reason, make them conscious of problems to be solved. It is futile to attempt to get reasoning simply by admonishing students to think. Thinking does not occur in a vacuum. If a person is not acquainted with a particular problem, how can he possibly think about it? How many readers

have spent any time trying to design a slide or lever action for a rifle that would be stronger than current designs? It is safe to say that few if any have been aware that such a problem existed. How can we think about the problems of chemical research if we do not know what they are? If, then, we are to have reasoning by students, we must first of all make them conscious of problems without presenting solutions that have already been worked out. In most cases, when we present a problem we present also the solution, so that all the student has to do is to memorize problem and solution together. This is especially true in elementary courses, although in more advanced courses unsolved problems usually receive more emphasis.

It is also essential that the problems presented be adapted to the experience and mental level of the pupils concerned. As an example of this we may take some problems in arithmetic cited by Pyle.¹⁸ These have been placed at the grade level at which they were first passed by 75 per cent of a class.

1. If one apple is worth two pennies, how many pennies are two apples worth? (90%, third grade)
4. If a pencil costs two cents, how many pencils can you buy for eight cents? (80.5%, fourth grade)
6. If two men can paint a house in four days, how long will it take four men to paint it? (78%, fifth grade)
7. If you can buy four apples for eight cents, how many apples can you buy for ten cents? (85.5%, sixth grade)
9. If it takes a cup of sugar to make candy for four people, how much sugar will it take to make candy for six people? (79%, sixth grade)
10. If two apples are worth four pennies, how many pennies are three apples worth? (75.5%, seventh grade)

Figure 23 shows the increase in ability to solve two of these problems, Nos. 7 and 9. It is interesting to note that, although the two problems are of about equal difficulty at the eighth grade level, problem No. 7 is much easier for third graders.

A great deal of experimentation will be necessary to determine the grade levels at which particular problems can best be presented, but, even when this has been done, there will be the further problem of individual differences within a single grade. This is shown by the fact that some third grade pupils (15%) solved the hardest problems in the above list but no problem was solved by all the pupils in a grade until the tenth grade.

Arouse Interest.—The second step necessary for very much reasoning about anything is that interest must be aroused in it. The Freudians have especially emphasized the point that we dwell mentally on those things that concern us. When, therefore, we become interested in something we dwell upon it, in season and out of season. We think about it as we walk and as we ride. And since time is usually necessary for solving a problem, it is essential that we care enough for the problem to stay with it. Inventors and others, who have solved hard problems, have in numerous instances had to work at the task for years before finding a solution. There is consequently not much chance that a difficult problem will be solved by a person who is not interested.

Interest is aroused typically by linking a problem with something that already interests the individual. Most unmarried young ladies can be interested in problems relating to cooking by linking such problems up to their interest in men and in the future management of a household. But it might be a bit more difficult to find a basis for developing their interest in the niceties of Greek grammar. However, if the curriculum has been constructed properly and students have been suitably classified, there will be some sound reason for everything that the student is asked to do. If this is the case,

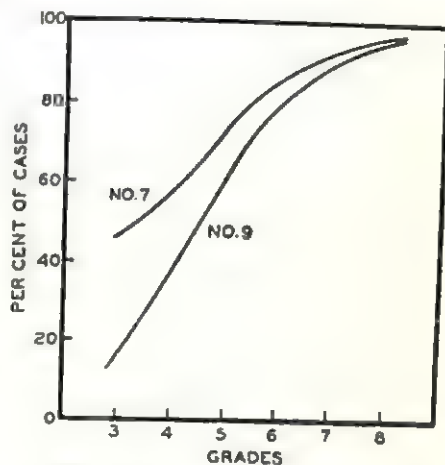


FIG. 23.—The percentages of pupils in successive grades who solved two problems in arithmetic. Data from Pyle (13).

it should not be difficult to develop interest in any problem that may need to be presented.

Aside from the interest in any problem *per se*, there is a widespread interest in solving problems simply for the fun of the activity. This seems to be true in the case of such activities as working at puzzles. A tremendous amount of effort has gone into the solution of cross-word puzzles and jigsaw puzzles. At times they have been almost a national mania. If, then, the teacher can present other problems effectively, it should be possible to arouse a lot of effort simply for the sake of the activity. And if a real interest develops in the problem, the mental activity will tend to continue at intervals until the problem is solved.

Teach Facts.—As pointed out at the beginning of this chapter, reasoning is a process of controlled association. It depends on the manipulation of mental content. It is an attempt to solve a problem by applying to it some new interpretation, but this new interpretation must grow out of our experience. This is to say that all successful thinking must be based on facts. Only the chemist has the factual background necessary for solving a problem in chemistry. Only the pathologist has the facts necessary for effective reasoning about the causation of cancer. In any case, however, even the expert may be lacking in the facts necessary for the solution of the problem. In that case he also must wait until the essential data can be collected.

In the teaching of facts, rote and rational memory methods will be used. The reason for mentioning the matter here is that facts form the basis of reasoning and consequently must be taught before real reasoning is possible.

Teach Methods and Techniques.—Special methods and techniques are used in scientific investigations, and it is necessary to understand these, both in order to do original research and in order to understand studies that have been made. One cannot, for example, reason in the field of statistics unless he has some familiarity with statistical methods. Hence it is necessary to become familiar with these as a basis of reasoning about many psychological, educational, sociological, and economic problems. Furthermore, these methods and techniques are specialized and differ in different fields. Ordi-

narily the physicist does not know and does not need to know the specialized methods and techniques of the botanist. Neither is likely to be prepared to do much original thinking about the problems in the other's field.

Develop Principles Inductively.—In many cases principles will be understood better if they are developed inductively. This may be true both of principles usually presented on the basis of authority, as in grammar and spelling, and of principles normally developed deductively, as in geometry and trigonometry.

As an example, we may consider the parts of speech. A page, or several pages, of text could be presented with all of the nouns underlined. The class could then study these words and formulate a definition for a noun instead of having it given to them to memorize. This could be repeated for each part of speech. A more difficult assignment would be to take a page or two of text and attempt to classify all words into groups and work out the parts of speech on this basis. This, however, would take more time and more skill on the part of the teacher. In a similar way, rules in spelling and in arithmetic could be worked out inductively from examples so that the students would have a better understanding of them.

In a deductive subject, such as geometry, the method could be used by first making an inductive empirical study. Consider, for example, the proposition that in a right angle triangle the square of the hypotenuse is equal to the sum of the squares of the other two sides. Different triangles could be made and measured and a general rule developed from these measurements. After this has been done, the regular deductive proof of the proposition could be learned.

Another case in mathematics in which an inductive approach is especially useful is in teaching trigonometric functions. Students who learn from a book the definitions and particular values of sines, cosines, and other functions may regard the whole thing as a dark mystery. If, however, they start with actual triangles and measure them, and then work out the underlying principles inductively, a much better understanding should result, although this will naturally take more time than the conventional approach.

Time Essential for Thinking.—Observational learning and simple memorizing can be controlled ordinarily so that there will be fair assurance that learning will take place within a given period of time. This is not true in case of problems that require reasoning. The more complex and the more novel the situation, the longer the time required. Moreover, this time requirement may extend to an indefinite period of time. For example, economists have been trying for years to solve the problem as to what causes the cyclical ups and downs in business, the alternating booms and depressions. It is quite evident that the leaders in business did not understand the situation in 1928-29 because many of them thought our economy had reached a permanent new high level of business activity and profits; but the actual result was a devastating crash. So it is with many problems: mankind may grope for generations before the collective intelligence and experience of society is able to solve a problem. Obviously, then, an individual working alone may easily spend a lifetime and not reach a solution.

While it is not proposed that world problems are to be solved in a class period of thirty or of fifty-five minutes, any problems that may be assigned to a class are likely to require a very considerable period of time if they are to be solved by individuals working independently, and these times for different individuals will vary tremendously. In a class experiment with the Freeman Puzzle Box, one student opened the box in two minutes while another student had been unable to make an intelligent start on it in an hour. In order to provide for these variations in time required for solving problems, it seems almost necessary to have the work done on some kind of project basis where each student works alone and at his own speed. This may be done as supervised study or as work outside of class. Problems could be graded with respect to difficulty and arranged in order from easy to hard. The slow students could be asked to do only the minimum while the fast students could do all, and perhaps be excused part of the time so that they could work on other subjects, or do library work. In any case, the conventional recitation will have to be abandoned if we are to have much actual independent solution of problems. In Herbart's five formal steps

an attempt is made to obtain reasoning, but time cannot be given to permit the slow pupils to think for themselves. Consequently they sit and listen while the fast students do any thinking that is done.

When problems are assigned to be done at home, a new difficulty arises. Cooperative enterprise takes the place of rugged individualism. Students work together and the less able copy the results of the more able. Also parents and neighbors are drawn into the picture. So what started as a group of individual projects becomes a community project. The individual may get the right answers, but, likely as not, he does not know how they were arrived at, and he could not do another problem of the same kind. What originated as a project in reasoning may end as a project in rote memory. The surest way to avoid this result is to have reasoning done in the school under supervised study. Purely from the point of view of variations in time required, it would be better to have the work done at home, but because of the danger of collective action, work at school would be better if time for it can be arranged. In cases where this cannot be done, it is very desirable that assignments be varied according to the abilities of the students.

Develop Self-confidence.—Studies of genius have shown that the most successful original thinkers have been characterized by a high degree of self-confidence, and, in agreement with this finding, studies of thinking in children have shown that success depends to a considerable extent on self-confidence and on an active, aggressive approach to the solution of problems.^{2,8} It is consequently essential that teaching procedures be adapted to this requirement.

Self-confidence may be, to some extent, a fundamental personality trait, but it also undoubtedly depends largely on success in dealing with particular situations. The student who has usually been able to solve problems in arithmetic will have confidence in attacking new problems while the student who has had very little success will expect to fail to solve new problems, and he may for that reason refuse to put forth much effort in that direction.

In order to meet this difficulty, it is necessary that the tasks assigned be adapted to the abilities of the students. Some will need a great deal of practice in working with very simple problems, while

others can progress rapidly to more difficult ones. Some will need a preliminary review of relevant facts, skills, and principles before attempting to solve problems, while others may find this unnecessary. In college physics, for example, many students will find it necessary to review their high school algebra before they are able to solve the problems assigned.

In view of these facts, it is evident that group instruction alone will not be sufficient to meet the individual needs of a class of thirty students. Individual difficulties must be diagnosed and corrected and assignments must be varied according to the progress that has been made.

Transfer in Reasoning.—Judd emphasized the idea that the greatest amount of transfer may be secured through teaching of generalizations and through teaching students to apply these generalizations. This means that in those situations where general principles can be taught so that they will be thoroughly understood there are great possibilities of securing transfer through deductive reasoning. Obviously teaching procedures should be planned to facilitate such transfer whenever it is practicable. More specifically, if principles are frequently applied in connection with class projects they are more likely to be applied to new and different situations in the future.

There is also the traditional idea that reasoning power may be improved, in general, by the study of particular subjects such as logic and mathematics. For generations students have been encouraged to study geometry on the assumption that the practice in reasoning about geometric figures and the improvement of reasoning in the field of geometry would bring about a general improvement in reasoning; but experimental and statistical studies of the problem have usually failed to lend appreciable support to this popular view. The study of geometry does ordinarily result in better reasoning in geometry but not in economics or in politics.

If we review the principles set forth in this chapter, it is easy to see why the study of geometry does not result in better reasoning in all areas of experience. Reasoning, we found, starts with some

particular problem. Obviously one does not learn the problems of economics or of politics or of hygiene by studying geometry. In the next place we found that reasoning depends on interest. Yet interest is not only specific, but interest in one thing tends to make less likely interest in unrelated things for the simple reason that when we are interested in something we think about it to the exclusion of other things. As a result, the more engrossed one becomes with mathematical problems, the less time and interest he has for other things. Similarly, we found that thinking as a process of controlled association consists in the manipulation of facts. Here again, it is obvious that the facts learned in geometry are not the facts needed to solve a problem in social relations.

There is another very important but rarely mentioned reason why training in mathematics has little or no effect on reasoning in other fields. Mathematics is deductive whereas our most serious difficulties in reasoning are very often in induction, which is an entirely different kind of process. In conventional mathematical reasoning we do not encounter the problems of scientific induction. These can be learned only through working with them directly.

The nearest approach to generalized training in reasoning would be through the study of logic. Here will be found a more detailed study of reasoning and of the sources of error in reasoning. Such a study has at least some chance of being of value to the better students who have the necessary intellectual maturity and who will make the effort to use what they learn. However, the actual average value of such courses has not been determined.

An improvement in reasoning *in general* would be equivalent to an increase in intelligence and in the intelligence quotient. Yet no appreciable increase in intelligence has been found to be associated either with the study of mathematics or of logic. As a matter of fact the growth of intelligence is slowing down or has stopped when these subjects are studied. In connection with this point, it is perhaps worthy of note that those who appear to have the greatest faith in the possibilities of improving intelligence through good environment and training usually hold that the early years offer the greatest opportunities. The pre-school years are considered the really

important ones. This clearly excludes any great effect of any school subject.

Nothing in the foregoing should be understood to imply that training is without effect in determining the results of reasoning. Training is not only important, but, considered in the broadest sense, training is a necessity for successful reasoning. Some experience is an indispensable prerequisite to the understanding of problems, to being interested in them, to knowing facts about them, and to any considerable familiarity with techniques and methods. Only through years of study in a medical school will the intelligent student be prepared to reason about a host of medical problems. Without training he does not even know the problems exist. But although some general principles of method *may be learned* in one field and *may be transferred* to other fields, the essentials for successful reasoning in any particular area are for the most part highly specific and do not transfer to other fields. For this reason training in reasoning should be as closely related to life problems as is possible under school conditions.

Teach Sources of Error.—Since reasoning very often leads to conclusions that are at least partly false, it is evidently worth while to pay particular attention to the problem of avoiding error. Even if the reader does not admit that errors are quite so common, it cannot be denied that very many errors are made. For this reason the avoidance of error should be a primary aim in dealing with the problem of reasoning.

There are some sources of error that are common to many fields of thinking, while other sources of error are peculiar to particular fields. A few of the more common ones will be given briefly; the more specialized ones must be learned through work in the different subjects.

Beware of an unfair selection of cases. Many false conclusions are arrived at simply because the facts on which the conclusion is based are not representative. Popular opinion supports many ideas that are not in line with scientific findings. For example, it is commonly held that it is dangerous to be mentally precocious, that those

with strong backs usually have weak heads, that beautiful ladies are dumb, and that opposites attract each other in marriage. Specifically it is stated that tall men tend to marry short women. Careful statistical checks show all of these statements to be false. Why then the error? It is probably due to the fact that we pay more attention to cases that are unusual, and, for the same reason, we are more likely to remember those particular exceptions to our general observation. Consequently, when we think of particular cases as a basis of a generalization, we recall the atypical cases. For this and for other reasons as well, it is dangerous to attempt to generalize on the basis of what we remember about random observations.

Scientists who are working in such fields as biology, psychology, education, and sociology have to be especially careful to get a group of cases that is a fair sample of the population about which a generalization is to be made. For example, one could not determine the average intelligence of the population by studying a group of high school graduates, because they are a superior group with respect to intelligence. Those with very low intelligence have not graduated from high school.

Small Samples and Complex Conditions.—In the early years of the Bolshevik government, travelers returning from Russia not infrequently gave contradictory reports about events and conditions in that vast country. One gentleman who had spent a long time in Russia commented on these contradictory reports by saying that all of them might be true. In a country so big and in process of such rapid changes many diverse things might happen. Evidently, then, a traveler who had spent ten days in a limited part of the country could not safely generalize as to what was happening in the entire country. This is true in principle with reference to most complex problems: neither a limited amount of experience nor a limited number of cases is likely to provide a safe basis for a broad generalization. It is not only necessary to have a fair sample or an unselected sample of cases: it is equally necessary in making inductions to have a large number of cases in those fields where conditions are complex. However, in sciences, such as physics and chemistry, where conditions can be controlled in the laboratory, it will ordinarily not be

essential to do many experiments. But in the less exact sciences, and especially where laboratory control cannot be used, safety must be found in numbers. It is quite essential that this be impressed on the students and that the principle be adhered to in work done in any course.

In work at the college level, use may be made of statistical methods in determining the reliability of inductions, but at the high school and elementary levels, this ordinarily cannot be done. Yet it is possible even in the grades to show that a conclusion based on a few cases may be misleading.

Look for negative cases. It is said that whenever Charles Darwin arrived at a tentative generalization he made it a regular practice to look particularly for exceptions to the new rule.

There is a popular saying to the effect that the exception proves the rule. This is usually understood to mean that the finding of an exception tends to *establish* the rule. This is because the common understanding of the word "prove" is about the same as "establish." Actually, *prove*, as used here, means *test*. And the implication is quite clear that when an exception is found, it *tests* and *destroys* the rule. Logically a single exception to any sweeping generalization invalidates it. Therefore, if even one exception is found the generalization must be modified to include the exception.

In the biological and social sciences, general laws are less often found. Generalizations are usually of less sweeping character and are so formulated that exceptions are possible and are admitted. A given result may be due to different causes at different times, and at any given time it may involve the combined action of a number of factors. This is often the case in the fields of psychology and education. Under these conditions a single exception does not invalidate a tendency. Something may be true on the average even though there are many exceptions. A dose of poison just strong enough to kill the average man would not kill all men. This being the case, generalizations must be formulated so that they say precisely what they mean. Then if negative cases are found that violate the restricted generalization, the generalization must be further modified.

Generally speaking, the student must learn these things through work in particular fields. There are special sources of error in each field of thought and these should be learned. But in all fields of reasoning the cautious thinker should learn to look for evidence that does not agree with the conclusion as formulated. This is another reason for impressing the student that his original conclusions are probably incorrect. If he can be impressed with the force of this statement, he is much more likely to look for negative evidence.

Avoid prejudice. Francis Bacon emphasized the importance of emotional bias and prejudice in determining the conclusions we arrive at in thinking. The Freudians have in recent years added to this emphasis. It requires continual reiteration. Politicians, rabble rousers, and others who wish to convince the crowd, but have a poor case, make use of emotional appeals as a substitute for legitimate evidence and argument. The high pressure salesman tries to appeal to the cupidity of his intended victim by making him believe that this is a rare bargain and will be sold at once. The dramatic orator, seeking to move his audience, speaks in a voice suffused with emotion and makes violent gestures. He paints vivid pictures of striking individual cases. He makes much use of conventional symbols such as "the flag," "the home," "motherhood," "red," and "the full dinner pail."

In the social sciences, it is most important that the student learn to look for and evaluate the effects of bias on thinking. Let opposing views be stated as fully and as frankly as circumstances permit, then reduce these statements to simple and straightforward claims with a definite tabulation of arguments and evidence. Let this tabulation be examined without emotional heat. When an argument seems to depend largely on the oratory of the declaimer, try the experiment of having the argument read by a student who can present it in a rather slow and monotonous voice. If the student is not particularly impressive in appearance, so much the better. This procedure will make it possible to consider the argument more nearly on its merits.

Study arguments on all sides of a question. There are at least two sides to many questions, and it is not unusual to find two extreme

positions taken on a question. In such a case, it is not improbable that both extreme positions are wrong and that the truth is probably closer to an intermediate position. This is something that the student needs to learn by a study of different questions. He needs to develop an attitude of skepticism toward all extreme positions. Aristotle's doctrine of the mean has an application here. The wise and rational man avoids extremes and takes a middle position. This, Woodworth tells us, is what most psychologists do with respect to psychological schools. They are middle-of-the-road psychologists. The principle holds with respect to most other things: avoid all extreme positions, but be prepared to accept anything that is sound regardless of the source.

Avoid confusion in language. Social communication takes place mainly through the use of language. It is the common medium for expressing, recording, and transmitting facts, opinions, and arguments. Accordingly, if Mr. X is to convey with exactness an idea to Mr. Y, it is essential that words have the same meaning to both. Yet, since the understanding of language depends on the peculiarities and chances of individual experience, it is safe to say that no complex statement ever means precisely the same thing to two people, and perhaps not even to the same person at two different times. At best, then, language is an imperfect means of communication.

This weakness of language is recognized in the sciences. They spend much effort in attempting to overcome it. In order to secure exactness, great care is used in formulating precise definitions. Exact definition is, as Plato taught, one of the primary functions of science. When a word has acquired meanings that are considered false or misleading, we often find a tendency to drop that particular word and to substitute some other word that is devoid of misleading associations. This has been true, for example, with regard to the word "instinct." It has meant so many different things to different people that many writers have tried to avoid confusion by using other expressions. However, the avoidance of the term does not solve the fundamental problem associated with the word "instinct." In this and other similar cases, accurate definition must wait for more complete experimental evidence.

In those cases where the experts agree fairly well on the meaning of a word, there still remains the fact that most of the population are not language experts and, as a result, will err in the use and understanding of words. It is necessary, therefore, to be constantly on the alert in order to avoid as far as possible the misunderstandings that cannot be entirely eliminated from the use of language.

More specifically, this means that special attention should be given to teaching the vocabularies and the concepts used in different sub-

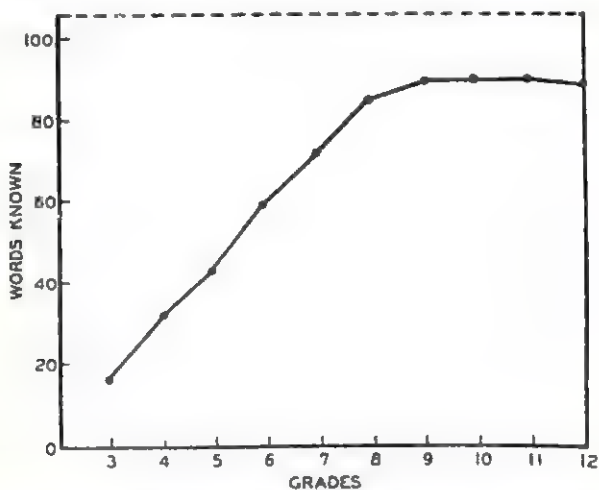


FIG. 24.—The growth of understanding of mathematical vocabulary. This shows the number of words understood at different grade levels out of a list of the 106 most fundamental mathematical terms. From Pressey and Moore (12).

jects. Obviously if children do not understand the words used, they cannot understand either the reading they do, or the instructions given by their teachers. Much of the difficulty in arithmetic, for example, is based on a lack of understanding of the technical vocabulary used. Pressey and Moore¹² prepared a list of the 106 most fundamental terms used in mathematics, and gave these to pupils from the third through the twelfth grades. The results are shown in Figure 24. The highest average score found was 89. Even at the twelfth grade level, "dividend" was understood by only about 55 per cent of the pupils and "per cent" by only about 30 per cent. Evidently, then, if a problem calls for finding 20 per cent of a number,

many twelfth graders would not know what to do. This is one of the chief reasons for the difficulty of abstract subjects: many students do not understand the vocabulary used.

Debating.—Debating is often recommended as a means of training students in reasoning. That it has some important educational functions cannot be questioned: it trains in expression, helps one to learn to think on his feet, helps to overcome stage fright, and, through study of questions for debate, it should add considerably to knowledge on some subjects. On the negative side it can be urged that the conditions under which debating is carried on are not conducive to the best reasoning. In the first place, the debater is usually out to prove or to disprove a given proposition rather than to find out the truth about it. Both the affirmative and the negative positions may come into conflict with important facts, and in this case the debater must endeavor to minimize or to controvert the evidence. The debater is not encouraged to assume the neutral and unbiased position that is necessary for the greatest success in reasoning. He has a personal and social stake in the outcome, and this in some cases results in a level of emotional fervor such as may be found in important athletic contests.

A further serious disadvantage of debating is found in the fact that in the debate a position must be taken at once and a decision is usually rendered by judges at the end of the debate. In science this is never true, and in life it is usually not true. Some life decisions must indeed be made at once, but we have months and even years in which to arrive at many important decisions. It is most important that we learn to wait in such cases until the evidence justifies a conclusion. For this reason the virtues of the ready debater are not the same as the virtues of the accurate reasoner.

A third disadvantage of debate as a means of training in reasoning is found in the fact that most arguments used in debate are essentially deductive in character. Yet, as stated above, our greatest difficulties in reasoning are likely to be in the inductive field. Scientific generalizations are arrived at as a result of long and careful study of individual cases, and any generalization reached

is essentially a concise descriptive summary of the findings. Scientists, therefore, are usually inclined to decry debate because they have learned its comparative futility. They prefer to resort to the laboratory and collect more relevant evidence. They must reason to do their work, but they endeavor to avoid the sophistries and the case pleading commonly associated with debate.

A Sample Study.—Thorndike and Upton studied reasoning by teaching a unit in physics to a group of mathematics teachers who were college graduates. This work seemed to have about the same degree of difficulty for this selected group that algebra would have for students in high school. Since some of the conclusions seem also to be applicable to much of the teaching of physical sciences and mathematics below the college level they are quoted here ¹⁵ (p. 327):

There was general agreement among the subjects that each item of fact or principle should be applied as soon as learned, that miscellaneous problems requiring the selection of appropriate principles should be given later, and that many short problems with a minimum of computation and interpretation of complex situations should be given first. There was general agreement that even with the very scanty problem list of the book used, the problems explained the text as truly as the text explained the problems. There was substantial agreement that the learner should be enabled to ascertain whether his work was correct very soon after he finished any part of it and very often along its course. Sample problems requiring the use of formulas should be solved in the text as illustrations of the formulas.

Specifically, it may be emphasized that numerous simple examples and problems are desirable as a basis of clarifying principles and their applications, and that students should be able to determine at once the extent to which they have been successful. This would seem to be an argument for supervised study, or for work on problems as a laboratory project, with a teacher or an assistant on hand to give any needed assistance. It further suggests that answers to problems in textbooks should generally be supplied in the textbooks even if these answers are at times improperly used.

The Class Period.—What shall be done during the class period in courses or in those parts of courses that endeavor to emphasize individual reasoning on the part of the student? The actual working out of solutions to problems cannot be done in class unless the time of the class is used for supervised study, but the foundation work in the way of learning problems, facts, and methods, and developing interest in these problems can be done by the lecture method, by demonstrations, by assigned readings with class discussion, or even by assigned readings with objective tests to check up on performance. In most cases, however, it will be difficult to find readings that will take the place of class discussion in developing interest in, and understanding of, the problems that are to be solved by reasoning.

Examples of solutions of problems should be presented in class and explained in order that students may become as familiar as possible with methods of procedure. Then when work has been done outside of the regular class period, there should be a follow-up discussion to check up on work done and correct errors as well as to develop further the implications of the conclusions reached.

Examinations and Marks.—Since the school cannot add appreciably to the basic reasoning capacities of the students, it would not seem fair to make an examination rest too heavily on intelligence. What can be taught, as we have repeatedly noted, is a knowledge of problems, facts, and methods. How successful the student is in using these in the solution of new problems will depend largely on his interest and his intelligence. If, therefore, we are to use our examinations to test what we have taught, we must use them primarily to test knowledge of problems, facts, and methods, even in those courses where we emphasize original thinking. If we put the emphasis on the correct solution of problems, we shall probably be basing our grades unduly on native intelligence. The fairest procedure would seem to be to base both examinations and grades more largely on those things that are the basis of reasoning rather than on the successful completion of original and complex problems.

QUESTIONS AND EXERCISES

1. Analyze psychologically the process of reasoning.

2. Distinguish between inductive and deductive reasoning. When is each used?
3. How are reasoning and memory related?
4. What are the chief reasons why the young child is not able to reason out solutions for hard problems?
5. Distinguish between reasoning and rationalization.
6. Why does training in reasoning tend to be specialized rather than general in character?
7. What can be done to meet the difficulty caused by the fact that individuals differ greatly in the time required to solve problems?
8. How are self-confidence and reasoning related? How can self-confidence be developed? How destroyed?
9. How does training influence success in reasoning?
10. What is the true meaning of the statement that the exception proves the rule?
11. How does prejudice influence reasoning?
12. What dangers are inherent in the use of language in discussions of problems with other people?
13. What are the arguments for and against debating as a means of training in reasoning?
14. Summarize the things we can teach that will afford a better basis for success in reasoning.
15. Why should actual success in reasoning probably be minimized as a basis for determining class marks?

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CHAPTER 9

TEACHING MOTOR ACTIVITIES

Motor Activities in Education.—The major part of the work we do in the schools is intellectual in character, but skilled motor activities that must be learned are also involved in much of the work that is done. The motor aspect of athletics is obvious and requires no comment. Speech, whether oral or written, requires the acquisition of complex motor skills. Art whether in the form of instrumental or vocal music, painting, sculpture, dramatics, aesthetic dancing or architecture requires expert skill in production. However excellent the sentiments of an orchestra may be, only through motor performance can they convey their feelings to an audience. Similarly, aesthetic dancing is not art unless it is expertly executed. Manual arts and trade training ordinarily require that things be made. It is not enough that the student have an intellectual understanding of how they are made: he must actually make things with a fair degree of precision. Laboratory work in many fields requires the development of motor skill in the handling of apparatus. Only through training can the histologist develop the skill necessary for dissecting out and exposing *in situ* the nervous system of a 10-mm. pig foetus. Even the drawings made in the biological laboratory at times require great motor skill. This is becoming more and more a machine age, and both in school and out, we are finding it almost necessary to learn to operate and perhaps in some measure to repair complex machines. That our skill is not always equal to the demands placed on it is shown by the long list of accidents. These occur not only to automobile drivers on the road but also to many in factories and even in homes. The acquisition of motor skill is then a most important part of educational training.

Aspects of Motor Activity.—Without attempting any very

profound analysis of motor functions, we may note that strength, speed, precision, rhythm, timing, coordination, and fatigue are important aspects of motor execution. All of these are influenced by training.

Strength is often thought of as depending almost entirely on the muscles. Actually it depends largely on nervous control. It is not the energy in the muscles that counts: it is the nerve stimulated contraction and relaxation of the muscles that determines what happens. College women probably do not do more manual labor than the average woman, but they have on the average greater strength of grip. The superiority here is probably due more to nervous superiority than to muscular superiority.

Also, as is well known, muscular strength improves with exercise and practice. A plains Indian with little food and rest could cover long distances on foot in a day. A sedentary white who gets his exercise by pressing the accelerator in a car, by signing a check to pay the repairman, and by cheering lustily for his football team, may feel badly used up when he walks two or three miles.

Simple speed of response is probably mainly dependent on native characteristics of the nervous system, but in complex activities it usually involves the effects of training. The beginner at an activity, skating, for example, is usually slow and clumsy. After several years of practice, however, he may develop great speed. A major part of this increase in speed is due to the elimination of random and unnecessary movements, and to better coordination in general. Also, to some extent, practice tends to increase the speed of movement itself. In a simple tapping test, for example, a limited amount of practice may result in a 10 per cent increase in the number of taps made in ten seconds.

Rhythm is closely associated with music and dancing but enters also into many other motor activities. It seems to be based on a fundamental motor tendency to repeat simple responses. This comes out in the babbling of the baby and survives in such words as baby (ba-ba), mama (ma-ma), daddy (da-da) and papa. Among Europeans it appears frequently when they say "Yes" with any degree of emphasis, as in the German "Ja, ja," the French "Oui, oui," and the Spanish "Si, si." When a more than ordinary emphasis is

intended, the repetition may involve a definite rhythmic cadence: "Oui-oui, oui-oui." Poetic forms are good examples of this rhythmic cadence, and their early development and survival give some indication of the fundamental character of the tendency.

Timing is important in the execution of complex responses, such as striking a golf ball or hitting a baseball. The golf ball rests in a fixed position and might be struck with a very poorly timed blow, but for best results on long shots the club must show maximum acceleration at the instant of contact with the ball, and, on shorter shots, essentially the same condition holds if the shot is to come off as intended. If the maximum acceleration comes too soon or too late, the shot does not come off properly. In baseball the problem is further complicated by the fact that the ball is moving. Hence the blow must be very precisely timed or the ball may be missed entirely even though the bat goes through the proper arc. A slight failure in timing will mean that the ball will ordinarily be driven either to the right or to the left of the intended position. Likewise in automobile driving, the wheel must spin the right amount at the proper instant in order to negotiate the curve properly.

The term "coordination" is reserved as something of a general term to cover all other phases of the combination of the elements of complex acts. No ordinary act that we perform is done with a single muscle. Many muscles and nerves must act together to bring about response. If these do not work together in the proper combinations and in the proper sequences we do not get the result aimed at. Not infrequently the inexpert typist may get all the letters in a word, but like Dunlap, he may write "hte" instead of "the," or he may make other similar slips. Some of these complex coordinations are innate. Such are the reflexes. And such are the more complex combination activities such as pecking and scratching in chicks, chewing and swallowing in humans, and the complex visceral and other responses associated with sex activity in all higher animals. But practically all of these innate responses—and this includes the reflexes—are subject to modification by training. Even the internal visceral reactions, which are not ordinarily considered subject to voluntary control, can be controlled to a considerable extent by indirect means. Jacobson has given practical examples

of this in connection with relaxation and tension. By developing better control over the voluntary mechanisms, control may be acquired indirectly over the associated involuntary mechanisms.

It is frequently stated that all acquired motor responses are based on native responses. This means that we are not able to develop any act that is entirely new: all learning of new motor responses must come through some combination and modification of response tendencies that are already present, either in a pure native form or as previously modified by experience. In the motor field, therefore, as in the intellectual field, all that is learned must be learned by being linked to the old.

Eye-Hand Coordination.—A large part of motor activity involves a motor response to a visual stimulus. In games of skill such as billiards, golf, tennis, and baseball, a stroke is delivered with the intention of sending a ball in a given direction. In driving a car, visual stimuli from the road and from other cars serve as the basis of the control of the car. In some cases the sensory stimulus may be auditory, but in most cases it is visual. In most mechanical work, and in a large part of factory work, motor responses are made to visual stimuli. It is evident, therefore, that the efficiency of this form of connection is of great importance in behavior. But the efficiency of such connections, like other mental capacities, varies greatly with individuals. This, consequently, is one of the factors to be taken into account in determining success in motor learning.

Fatigue.—All work, both mental and physical, requires the expenditure of energy and results in fatigue, but the amount of energy used in mental work appears to be rather small in comparison with that used in vigorous physical work involving the larger muscles of the body. For this reason, continued physical activity results in a progressive loss of efficiency. Also, with the onset of fatigue there is generally a relative loss of interest in the activity. Consequently very long practice periods are not advised in learning motor activities. But what is too long, we do not know. Pianists have at times practiced four hours without rest. Small children have been required to practice on musical instruments for two or three hours. Yet probably few adults are able to concentrate effec-

tively and practice intensively for longer than two hours at a time. In case of children, it appears probable that two hours of practice would be more effective if broken up into four periods of one-half hour each. Certainly the latter arrangement would be less likely to result in fatigue and loss of interest. Precisely what is best in any given case cannot, however, be stated without experimentation covering the particular situation. There are many variables that enter into a motor learning situation, and for this reason common sense must be used in determining what is best.

VARIATIONS IN CAPACITY FOR MOTOR LEARNING

Age Differences.—In the human infant at birth, coordinated responses are limited mostly to the vital reflex activities such as breathing and digesting food. When otherwise stimulated, the infant tends to respond with *mass activity*, that is, there is a diffuse and general body response in which the head, arms, trunk and legs are involved. When the baby is displeased with the world, he kicks, throws his hands and arms around, contracts his facial muscles, and exercises his vocal mechanism all at once and vigorously. With the passage of time and the development of maturity, mass action gives way to differentiated control. The small boy may use his fist to strike a blow. The older man may simply frown, or he may even keep his face straight and limit himself primarily to internal reactions.

An important part of the problem of motor training is to assist the learner to acquire differential control over the body. The golfer who is tense all over snaps his head up when he makes his stroke and very likely tops the ball. He must learn to relax the body except in so far as tension is required to hit the ball. Experts in any activity must learn differential control in which the parts of the body not actively engaged in a given movement are as relaxed as possible. This assists in doing the thing in question with greater precision and also conserves energy and reduces fatigue.

Another aspect of differentiation and specialization, which takes place both with maturation and training, is gradation of responses. The small child responds on an all-or-none basis. The

infant may cry with equal violence whether the offensive stimulus is strong or slight; he goes off like a gun, either violently or not at all. With maturity and learning, he graduates his responses so that they suit the situation. He makes a weak response in some cases and reserves his strongest responses for those few occasions which require violent effort in order to cope with the difficulty. This problem is well shown in golf in relation to distance. A drive usually calls for maximum distance; hence the player hits for all the distance of which he is capable. Approaches to the green, in contrast, vary from full shots to very short ones. In earlier days golfers played with very few clubs and consequently found it necessary to graduate their strokes so that the same club might be used for very different distances; some even played a very good game with one club, such as a No. 2 iron. It takes great skill to do this; but, instead of developing this skill in varying shots to suit the distance, it proved to be easier to carry more clubs, with the different clubs graduated for different distances. This practice made it possible to play a better game with less skill. On the putting green, however, it is still necessary to rely on the nervous system to control the difference between a ten-foot putt and a thirty-foot one; and maturation, practice, and experience are necessary to acquire the delicate touch necessary for good results.

The same thing is true, of course, in other acts of skill. The violinist controls pitch by the precise placing of his finger tips on the strings, and this depends on motor learning. Similarly he must acquire the most delicate skill in handling the bow, particularly in connection with time and intensity, and, of course, the two hands must be coordinated. This means that natural motor capacity and long practice are necessary for the finest differential control.

This idea of the emergence of differentiated, graduated responses from more generalized total responses is based on the biological theory of evolution particularly as it was formulated by Herbert Spencer. It has been most emphasized in recent years by the Gestalt psychologists. They particularly have stressed the point that our more specific and graduated movements emerge from more generalized and diffuse movements. Pedagogically this means that we

must wait until maturation has provided an adequate basis for differential control. Then when control is possible, we have the problem of training the child to eliminate useless accompaniments of the desired act. In case of silent reading, for example, this requires the avoidance of lip movements and other unnecessary muscular tension.

There is a pattern of motor development with a rather definite sequence or order in which different movements and responses normally mature. Thus, a baby first crawls, then walks, then runs. The control of the big muscles of the trunk and limbs, sometimes called the fundamental muscles, tends to come first and is followed by the development of control over the finer muscles, such as those of the hand and fingers, which are, at times, called accessory muscles. The fundamental muscles are phylogenetically or racially older than the accessory muscles. In this respect, then, there is something of a parallelism between racial development and individual development: in both cases control over gross movements came first, with control over finer movements coming later. This fact has an important bearing on what we can reasonably expect of a child in the way of motor learning. We should not, for example, expect to succeed very well if we tried to teach a kindergarten child to do fine needlework.

Motor development, like intellectual development, depends on the two factors of maturation and learning. Maturation is the natural development of the nervous system and other structures which makes the child ready and able to engage in a particular activity whereas learning involves the modification of existing patterns of response.

The question has been raised as to the effect of practice and training on motor maturation. Is practice necessary for the maturing of native reactions? Does practice speed up the rate of motor maturation?

Spalding performed an interesting experiment which helps to answer the first question. He took young birds soon after they were hatched and placed them in cages that were so small that the birds could not even extend their wings. The birds were well cared for,

and when they arrived at the age at which the young of the species were normally able to fly, they were released. According to Spalding, they flew off without preliminary practice and showed good control from the first. This experiment suggests that normal development prepares the neuromuscular system for making certain responses and that practice is not necessary during this process. However, it is to be expected that performance, even in such cases will improve with practice.

There have also been some cases reported in which children have walked without the usual preliminary efforts, although of course, in most cases, parents and others give a lot of assistance, and the process is a gradual one.

Several experiments have been performed to answer the second question as to the effect of practice on speeding up the development of natural responses. These have shown usually that a small acceleration in growth could be produced by practice, but when such experimental children were compared with control cases it appeared that little if any permanent superiority resulted. From this the educational inference has been made that it is better to wait until a child is mature enough to learn an act readily before we attempt to teach it to him. He will then learn with less time and effort and will enjoy the learning process much more.

The effect of maturation on learning an activity is well shown in a study of typing by Wood and Freeman.²⁴ Different groups of children began in different grades to use the typewriter and consequently it was possible at each grade level to compare the typing speeds of those who had used the typewriter for only one year with those who had used it for two years. Figure 25 shows that, although average speed increased from grade to grade, there was no important difference at a particular grade level between those who had had only one year of practice and those who had had two years.

However, there is an important difference in the effects of maturation on the capacities for motor and for intellectual learning. Intellectual learning capacity increases from birth to maturity. Motor learning capacity also increases in some ways as indicated by the pattern of motor development, but, at the same time, increasing age

brings a loss of the motor plasticity that is necessary for learning new coordinations. As an example, suppose a German family came to this country when the parents were about 35 years old and the children were small but old enough to speak German. If these children went to an American school and associated with American children, they would soon speak English and might be expected to grow up without a noticeable German accent. The parents, on the other hand, might learn to speak English fluently but with a definite accent. They would probably never be able to pronounce "the" or "theory" because there is no "th" sound in German. Instead of "the man" they would say "dee man."

After the age of about 25 years really novel motor skills are much harder to acquire and are not so often learned. There are cases, however, which seem to be exceptions to this rule. One golfer with whom this writer played many hard-fought games took up the game after he was fifty years old. He became good enough to win many cups in

local competitions and even when he was past the age of 80 he could still "shoot his age" on a rather easy golf course. A local professional once commented that when Mr. X got within twenty feet of the green, and was not in a trap, you could count on his "getting down" in two more strokes. Any golfer who has struggled with hooks, slices, and topped balls knows that good playing requires a great deal of acquired skill. Hence when a man past fifty can begin the game and become distinctly better than average, it would clearly be incorrect to say that motor plasticity is lost at the age of 25.

Another respect in which motor learning differs from memory or other forms of intellectual learning is in the time required for

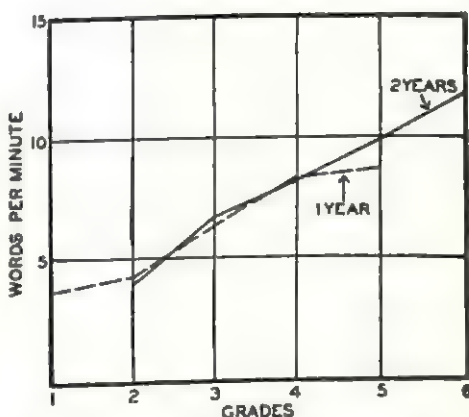


FIG. 25.—Speeds of typing at different grade levels after one year and after two years of practice. From Wood and Freeman (24).

mastery. Material can be memorized in a day or in several days, and, with a little review from time to time, it can be retained indefinitely. Motor skills, if at all complicated, cannot be learned in short order. The beginning golfer does not become a good putter in one afternoon or in several afternoons. Complex motor skills usually require years rather than days for mastery. Moreover, time seems to be an important factor here apart from the amount of practice. A statement made by William James has often been quoted to the effect that we learn to swim in winter and to skate in summer. The implication is that important readjustments occur in the nervous system in connection with motor skills even when we are not engaged in practice. Both practical experience and laboratory experiments often seem to support this idea. When practice is resumed after a long period of lack of practice, performance may quickly become better than it was when practice was stopped.

Because of these considerations, it seems wise to begin early in childhood to practice on the violin or other musical instruments and to learn swimming or other sports. Most of the great musicians and most of the great leaders in sport have followed this rule. As we understand the matter today, an illiterate man twenty years of age who has great natural talent both for mathematics and for the violin, but has had no training along either line, would be much more likely to succeed as a mathematician than as a violinist. Strength and speed of reactions increase until maturity, and endurance continues to increase beyond physical maturity, but plasticity is greatest in childhood and declines thereafter.

Sex Differences.—Some of the most conspicuous sex differences are found in the motor field. It is well established that girls mature physically faster than boys: at the age of six years the girl is physically about as mature as the boy of seven, and at twelve years the girl is about as mature as the boy of fourteen. A similar difference is found in rates of motor development. When strength of grip, for example, is expressed in terms of terminal status, girls of twelve years are about as mature as boys of fourteen.¹⁵ This is shown in Figure 26. However in terms of absolute figures, in higher vertebrates, females are generally smaller and weaker than

males, and this rule holds, of course, for humans. Girls and women also have relatively less strength per pound of body weight. This varies somewhat for different activities, but the average seems to be about 72 per cent.¹² When the difference in weight is considered, this makes the average college woman about 60 per cent as strong as the average college man.

The basal metabolic rate in women is slightly lower than in men, and the lung capacity is distinctly less. Girls and women thus do not have the physiological capacity for oxidation at the rate which would be necessary for them to compete in many motor activities on equal terms with males. Partly for this reason, girls and women are slower in speed of responses such as reaction time and running. In the latter, they are about 85 per cent as fast as men.¹² In tapping rates the sex difference is less.

Women have relatively longer trunks and shorter

legs than men, and, since women are on the average four or five inches shorter, this means that they have a further handicap for activities which require running. Under these conditions it is not strange that competitive sports have tended to be restricted to members of the same sex.

Girls and women have proportionately more fatty tissue than boys and men, which is helpful in swimming because it makes the body lighter and also serves as a protection against the cold.

In motor performances that depend on finger dexterity and flexibility of wrist movement girls tend to be better than boys and for this reason girls are able to dress themselves earlier than boys, and

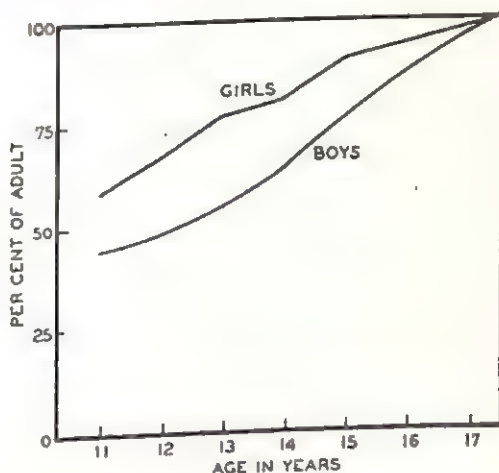


FIG. 26.—Growth curves for right grip in terms of terminal status. From Jones (15, p. 37).

girls show greater proficiency in such activities as knitting and needle work. This dexterity is also largely responsible for their excellent showing as stenographers.

A sex difference of a different kind is found in the fact that women have less competitive aggressiveness. They do not seem to care so much for rough sports such as football and boxing. Such activities are, in fact, quite "unladylike." Women take rather to activities involving grace and rhythm, as in dancing.

Specificity of Motor Capacities.—When a wide variety of different motor tests is given to a group and the scores on the different tests are correlated, the intercorrelations generally tend to be low.^{14,21} In other words, motor capacities tend to be specific and to vary independently of each other. The individual who is average in one capacity may be almost anything from poor to superior in another capacity. Only a few are exceptionally good in any considerable number of motor performances. The most successful goal kicker in football may not be a very good player in other aspects of the game. The girl who dances beautifully may have a very poor singing voice.

In somewhat the same way, scores on relatively simple tests of such things as motor speed, strength, and accuracy do not generally make it possible to predict scores on more complicated performances. For this reason the only sure way to determine a person's fitness for a given complex activity in school, in sports, or in industry is to try him out on the task itself or on something that involves about the same coordinations.

Relation to Intelligence.—Since motor performances generally show low intercorrelations, it is to be expected that they will also have a low correlation with intelligence of the kind that is tested by conventional intelligence tests, and that is the fact. Students of very high abstract intelligence may be clumsy and inept in motor performances; likewise expert athletes may be lacking in proficiency in the intellectual field. It is partly for this reason that men who go to college primarily because of athletic considerations not infrequently fail to make a creditable showing in intellectual work. This must, however, not be taken to mean that there is an inverse rela-

tionship between intelligence and athletic ability; for this is not the case, although we sometimes encounter the belief that such a negative correlation holds. If a really representative study of the problem could be made, we should expect to find a low positive correlation between intelligence and athletic ability, but the correlation would be too low to be of value in making predictions in individual cases.

Unilateral Dexterity.—One of the puzzling facts of human motor capacity is the unequal development of the two sides of the body. Few, if any of us, are bilaterally symmetrical either anatomically or functionally. From the hair of our heads to the soles of our feet we are different on the right and left sides. On some heads the whorl of the hair runs clockwise, but on other heads it goes counterclockwise. The two halves of the face are rarely the same. Strikingly different photographs of some people may be made by printing only the right side of a negative or film and reversing it to get the other side of the face, then doing the same thing for the left side of the negative. The two eyes are rarely equal optically, the right eye generally being the better eye. The right eye is usually the dominant eye and will be used in sighting, as in shooting a gun. However, the better eye optically is not always the dominant eye. The two sides of the body also usually show differences in the development of bone and muscle. One foot is usually larger than the other.

In most, although not in all, cases, a dominant right eye goes with a preferred use of the right hand for acts of skill and with the use of the right foot for kicking. A dominant left eye is less regularly connected with a preference for the left hand and the left foot.

Handedness turns out to be itself complex in that preference for the use of the right hand in throwing a baseball may go with preference for the left-handed style of batting, that is, one-handed preference may not agree with two-handed preference.

Careful studies of very young children have shown that a preference for one hand or the other is found soon after birth. It has also been found that children with left-handed ancestors are more likely to show an early preference for the left hand than are children without such left-handed ancestry.

Since the hand is used for writing, handedness becomes tied up with speech, and it has been reported that speech difficulties such as stuttering and stammering are more often associated with left-handedness and with attempts to teach left-handed children to write with the right hand. This problem will be discussed later in this chapter.

Many hypotheses have been advanced to explain the origin and the behavior characteristics associated with handedness, but for the most part these are not very helpful to the teacher. It is easy to see, however, that a specialization of function in which one hand developed greater skill would be favorable to survival under primitive conditions. The man with a somewhat stronger right hand who could consequently strike a somewhat harder blow with a club would be more likely to survive in a fight either with another savage or with a wild animal than would a man with two equally good hands neither of which was as strong as the one-sided man's better hand. Hence, without solving the problem of origins, we can see how natural selection would have favored one-sidedness if it appeared.

The attempt has also been made to link left-handedness with mental deficiency. This does not appear to be warranted by the facts and is furthermore not in line with plausible evolutionary theory. Differentiation and specialization are indications of ascent in the evolutionary scale. Left-handedness is as much an indication of such differentiation and specialization as is right-handedness. On this basis, therefore, we should expect the mentally defective to be more nearly ambidextrous. This appears to be the actual situation.

Individuality of Motor Responses.—In the teaching of spelling and of various other subjects we strive for uniformity. We never quite succeed, but we approach 100 per cent success in spelling at least the more common and simpler words. In case of motor activities, however, uniformity is impossible. A classic example of this is found in signatures. They are practically all different, and it is so difficult to duplicate the signature of another person that our banks are able to operate checking accounts with but little difficulty

from forgers. In fact, although each person has his own peculiar writing style, an individual is not able to duplicate precisely his own signature. If he signs his name several times, it can be shown, either by superimposing the signatures or by careful measurements, that they differ. This fact is used in detecting forgeries. If a forger signs a particular name several times, he is likely to do so by tracing a given signature. In this case the forgeries will be too much alike to be true signatures.

In the same way that signatures differ, we can recognize the differences between two individuals playing the same piece on a piano. They may strike exactly the same keys, but they do not do so in exactly the same way.

Not only are performances different but there does not appear to be any good reason, in most instances, why we should attempt to make them alike. What is wanted usually is results. The golfing professional who most consistently sinks his putts is the one who collects the prize money: it is not paid for perfection in golfing form. Moving pictures have shown that very successful performers in sports often vary from the accepted patterns of response. They have their individual styles. Likewise it has been found repeatedly that those who have attempted to imitate the experts have failed to get the results hoped for. This makes it harder for the teacher because instead of requiring a particular form, the teacher must be able to analyze each individual's reactions and adapt his responses in such a way that better results will follow. This means that a teacher needs a more thorough understanding of the performance he is attempting to teach.

Quotidian Variability.—Not only do individuals vary in their characteristic motor styles, but the same individual changes more in motor performances from time to time than he changes in some intellectual performances. Woodrow²⁵ has suggested the term "quotidian variability" for these variations in individual performance. As an example of this variation, Paulsen²⁰ found that motor steadiness varied so much that .80 was about the highest possible reliability that could be obtained from a test at a single sitting. In

line with this fact, we find that motor performances change considerably from day to day. Handwriting may change greatly according to the physical condition and perhaps the mood of the individual. The golfer is in top form today and is off form tomorrow. One of our leading golfers, while playing in a match, played well in the morning, won his match, celebrated with a heavy lunch, and was eliminated that afternoon. At best our motor system tends to be unpredictable, and this implies that patience and resolution are required on the part of both teacher and pupil.

CHARACTERISTICS OF MOTOR LEARNING

Motor Reactions Unconscious.—In memorizing we try to bring material clearly into consciousness. In motor learning we try for the most part to develop automatic and unconscious responses. As I sit writing this page on a typewriter, it is desirable that I concentrate on the ideas I am trying to express: it is most undesirable that I think about the motor coordinations necessary to strike particular keys in a particular order. This is rather generally true of motor activities. The motorist who is unexpectedly in a tight spot needs to act automatically. If he has to stop to think what he is to do, it may well be too late to do anything. This means that, as a rule, we wish to reduce learned motor reactions to well-fixed habits. For this reason motor skills may require more practice and drill than are required for some other forms of learning.

Motor learning involves less consciousness than other forms of learning for the reason that kinaesthetic sensations are less vivid in most people than are other kinds of sensations and for the further reason that part of the afferent nervous mechanism concerned with motor adjustments operates entirely without consciousness. For these reasons the conscious analysis and control of movements is much more difficult. In a way, however, this is fortunate because it enables and encourages us to pay attention to the end to be achieved rather than to be bothered with and distracted by the details of the movements themselves.

Trial and Error in Motor Learning.—Most of the learning in school is of the verbal memory type, either rote or rational, and is

subject to fairly definite control. Hence results under given conditions can be predicted with a fair degree of accuracy. In the motor field a relatively new and troublesome factor enters in the form of a trial-and-error element in learning. We can assign a vocabulary in a language to be learned and expect students to repeat it and learn it: we cannot in the same way ask a group of students to learn a new motor activity. No novice can become proficient in fancy ice skating without a great deal of trial-and-error experimentation. Neither can any tyro, without much experimentation, acquire real skill in throwing a curve ball with control. Many will never acquire much skill in either of these activities even with much instruction and much effort. Furthermore a person of considerable experience and proficiency in such things may find that his skill slips away from him in unexplainable fashion. A golfer may find that, although previously he could shoot a straight ball, he now hooks or slices in unexpected places. He may know the theory of hooking and slicing and still be quite unable to do anything at the time to correct the condition. In short there is a large factor of chance and uncertainty in motor responses.

This appears in individual learning curves for motor activities in that the graphs are frequently irregular and in the further fact that early scores and rates of progress are often not very highly correlated. This is shown, for example, in the four learning curves for mirror tracing which appear in Figure 27.

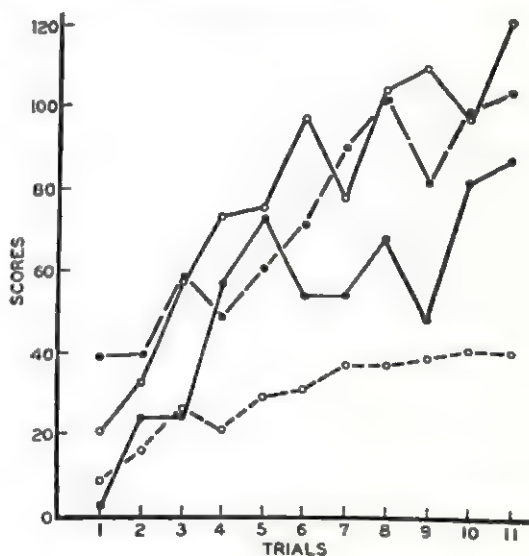


FIG. 27.—Individual learning curves of four students on a mirror tracing test. Three of the four curves show the irregular scores commonly associated with trial and error learning.

This means that in learning a new motor connection we have to do considerable experimenting to hit upon a coordination that will give a satisfactory response. We may get one quickly or we may never get it. We may get it momentarily and it may slip away from us. Our problem is, therefore, to experiment until we get a satisfactory response and then to fix this response as well as possible through persistent practice. Experts spend many hours perfecting and fixing the details of what seems to the observer a simple response. One of the painters is said to have spent several months in developing just the right brush stroke to give a natural appearance to the wooly coat of the sheep he painted.

Forgetting.—We have emphasized the importance of forgetting in connection with ordinary memory activities. The situation in connection with motor learning is somewhat different. Forgetting occurs here but is ordinarily less apparent. Most skilled motor responses are repeated many times until they become rather thoroughly mechanized. Also, we do not have the variety of motor responses that we have of ideas. Hence it is not surprising that a well-fixed response tends to persist for a long time. Pianists have quit their instruments for ten or even twenty years, and, on returning to them, have recovered in a short time about all they had lost. In case of ordinary memorized material, after twenty years the forgetting would be so nearly complete that the saving in time in relearning a part would be negligible. Yet golfers have quit the game and have returned after five years to play about as well as before. However, as we have emphasized, motor responses are variable, and in line with this variability it is found that severe losses in motor skills at times occur with a lapse from practice. All that we can say then is that they appear to be less likely to occur and that when losses do occur they can ordinarily be largely regained with less effort than is required for ordinary memory material.

A rare illustration of the retention of a motor skill over a very long period of time has been supplied by Hill.¹³ He had kept an accurate record of his success when he first learned to type. Then during most of a period of 25 years he did practically no typing and

very largely lost his skill. At the end of this time he began to practice typing according to his original schedule and found that in about one month he had regained the skill that it had required him four months to acquire a quarter of a century earlier. Hill's two learning curves are shown in Figure 28.

This may seem to indicate that motor memory is fundamentally better than rational memory, but there is reason for doubting this. Motor memory is, at times, durable for the reason that many motor habits are repeated thousands of times. An ordinary golfer may

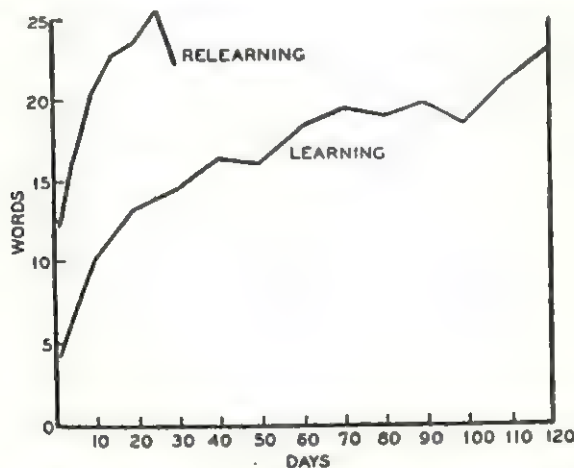


FIG. 28.—Relearning a motor skill after 25 years. This compares an original learning curve for using the typewriter with the curve for relearning 25 years later. From Hill (13).

make an average of 90 shots in 100 rounds of golf a year and he may continue this for ten years for the respectable total of 90,000 shots plus those in practice. A tennis player would do even more. Thus the responses involved in a golf or tennis stroke are repeated enough to be well established. But in the intellectual field, the great diversity of ideas prevents any such general repetition. The student does not have time to read over his lesson 100 times or even 10 times. And from this lesson he goes on speedily to another one which is probably on an entirely different subject. Fundamentally rational memory is probably better than motor memory, but so much is attempted in the rational field that much is forgotten.

Transfer.—Most of our educational efforts are aimed at assisting the individual to make a more effective or satisfactory adjustment at some time in the future. This means that we desire the training to transfer to some life situation.

On the whole, as Jersild ¹⁴ has pointed out, transfer in the motor field does occur but is more limited than in the intellectual field. A student who has learned a pencil maze is very likely to learn a second one in less time than was required to learn the first one even though the paths from starting point to goal are quite different. To some extent, at least, he has learned how to get through the maze with fewer errors and with less loss of time.

Training one hand or foot frequently makes it easier to learn the activity with the other hand or foot. This is known as cross-transfer. When, for example, one has learned to write with the left hand, it is relatively easy to learn to write with the right hand.

Experimentally it is perhaps easier to show negative transfer or interference than it is to show positive transfer. The familiar mirror drawing experiment is an example. The untrained subject trying for the first time to trace a star may find himself helpless and unable even to get started. An occasional student working with a two-minute time limit will fail on his first trial to move an inch from his starting point. His past habits of movement so interfere with the learning of the new coordination that for a time he is completely baffled. Some students become angry in the face of this frustration.

After a student has worked for some time at mirror drawing and has had some success in mastering the new skill, another form of inhibition at times appears in the form of retroactive inhibition. Some students complain that they cannot write. In one extreme case a girl found that her ordinary writing was seriously interfered with for a full hour after she had stopped the experiment. In other words, the learning of the new coordination had reacted on her previously established habit of writing and had temporarily upset it.

Interference and inhibition are quite likely to happen when two forms of response are related to the same situation. For this

reason the golfer who takes golf lessons to improve his stroke is very likely to find that the immediate effect is that he is worse than he was before the lesson. If he does not know this, he may quit the new teacher before he has had time to improve. The same would hold for playing the violin or for various other forms of motor skills. One very good violin student had developed some bad habits in playing. She went to a new teacher. After analyzing her difficulties, he required her to spend an entire summer on drills, with the specific requirement that she was not to attempt to play even one piece of music during that time. In this way he avoided the interference that otherwise would have wrecked her musical performances, and, at the same time, would have slowed up her mastery of the new technique. This may have been a hard prescription, but in the end she was a better musician.

Different forms of response to the same general situation can be mastered if necessary. In this case it is desirable that one of them be well mastered before the second is started. After that it is well to discontinue the first until at least a good start has been made on the second. Then it should not be too difficult to shift at will from one to the other.

Some more general results from training along particular lines may also be expected. Improvement of physical condition through one form of muscular activity should help along other lines. Success in one activity should give confidence in attempting other activities and this should help even if the actual activities have little in common. Likewise failure in one activity may have a negative effect on success in other activities.

Athletic directors and coaches have often expressed the hope and belief that participation in athletics would have general values in the way of improving character and personality. No doubt this is to some degree true, but with considerable variation in the effects on different participants. There is also the possibility and probability that the extreme emphasis on winning games may have a detrimental effect. Sportsmanship is a virtue to be acquired through losing gracefully as well as through winning magnificently.

SOME PROBLEMS IN MOTOR LEARNING

Whole versus Part Methods.—In Chapter 7 we discussed the problem of the part versus the whole method in intellectual learning. For motor learning the experimental results indicate that the whole method is better for some activities and the part method for others. Perhaps the best introduction to the problem is to quote from the account of an experiment by Cross ⁶ (p. 50):

The procedure used in teaching the whole method was to give the group a basketball and let them play the game. In the second group the minor game method was used by playing games such as indoor baseball, dodgeball, volley ball and relay games in the gymnasium classes. These games were used to build up certain fundamental skills which it was believed would be carried over into basketball. In the third group the whole-part method was used by dividing basketball into the fundamental skills. One fundamental skill was shooting which included high arch shots, back-board shots, set-up shots under the basket, the shot-put shot, and shooting straight at the basket. Passing, another skill, was taught under this method by easy passing to accustom the boys to handling the ball, and by the two-handed underhand pass. The final skills taught by this method were body movement and footwork, consisting of starts, sudden stops, full pivots, turns and changes of pace.

His conclusions from this experiment are as follows ⁶ (p. 54):

1. The simpler unitary skills (visual and hand coordination of catching ball, muscle coordination of passing ball, and changing from catch to throw) are best taught by the whole method.
2. The most complex skills and those that are intellectually complex as well as complex from the motor point of view (muscular coordination of handling ball, stopping and grasping ball, skill in shooting, visual and hand coordination of dribble, muscular coordination of feet, and ability to start and stop) are best taught by the whole-part method.
3. Skills of intermediate degree of complexity and ones which are easily carried over from simpler games in identical form (such as pivoting, change from catch to throw, ability to start and stop, and ability to jump) are best taught by the minor game method.

As used in the foregoing quotation, the whole-part method means the entire part, that is, in tennis, a player might practice serving. This is one entire unit or whole-part of the game and by concentrating on that one skill better results should be obtained. In golf, a player could profitably spend some time exploding balls from a sand trap, repeating the same shot over and over again until he had gained some proficiency. The pianist might profitably spend time practicing a particularly difficult bit of fingering, by repeating a short unit of the music over and over again. The golfer who tried to learn golf by playing the game as a whole from beginning to end would be too confused by the endless variety of different shots he would be expected to make. Consequently faster progress will be made by breaking the game into separate units and working on those, one at a time.

Shay made a comparison of the whole method and the progressive part method in gymnastics by using these methods to teach two matched groups the upstart on the horizontal bar. The whole method proved to be distinctly better. An average of 38.5 trials was required to learn by the whole method and 48.8 trials by the progressive part method.²² This is a saving of about 21 per cent by the whole method. In this case the movement is normally an integrated unit, and consequently it is not helpful to break it up.

In mirror drawing, the progressive part method has proved to be better. By breaking the star up into segments, and mastering one at a time, considerable confusion and waste of effort are avoided.

In general, we may say that, when movements are not too long and too complex but do involve continuity of movement in the finished performance, the whole method is better. Otherwise some form of part method is likely to prove more economical of time and effort. But when the part method is used, natural units should be kept together. Otherwise when the learner tries to put the units together he may find too much truth in the Gestalt maxim that the whole is more than the sum of its parts.

In cases of doubt, the only safe and certain way to determine whether the whole method or the part method is better is to perform an experiment with carefully equated groups and compare results.

On the theoretical side it is worth while to note that the whole method has less to commend it in the field of motor learning because one of the strong points in favor of the whole method as used in rational memorizing is that it gives the learner a better understanding of the relationships between the parts. This does not apply to a very great degree in motor learning.

Speed in Practice.—When an activity is eventually to be done at a rapid speed, should the practice begin at a rapid rate with the inevitable accompaniment of inaccuracy, or should early practice be slow enough to permit accuracy? There are two schools of thought here, some favoring speed with inaccuracy and the others favoring accuracy with less speed.

Probably each answer is correct in certain situations, and probably neither is correct for all situations. In typing, the aim is speed with accuracy, but in this case speed without accuracy would not be very helpful. Certainly it is better to go slowly at first and write what is intended than it would be to hit the wrong keys or to miss some entirely. Hence, for typing, it seems more effective to start with reasonable accuracy and build up speed through practice. There is no good reason why the absence of speed in the beginning should prevent its development later. If, however, the circumstances are such that the act must be performed with speed, then we must be prepared to accept many errors at first and attempt to reduce them. The baseball batter learning to hit a curve ball cannot get the ball to slow up so that he can hit it with a slow swing: he must make a fast swing or miss. In an experiment in batting, Fulton¹¹ found that emphasis on speed gave greater accuracy, but the final speed of the group that emphasized accuracy was as great as the speed of the group emphasizing speed.

Each learning situation should be analyzed, and if speed is not a necessary part of the reaction, it would seem better to start with reasonable accuracy regardless of speed, but when speed is a necessary part of the response, accuracy must be developed later.

Massed versus Distributed Practice.—For the most part, motor skills cannot be perfected in a short time. For this reason

distribution of practice periods in motor learning is usually inevitable. The length of the practice period that can profitably be spent on practice will depend, as in other kinds of learning, on fatigue and interest. Probably interest can be maintained in children longer in motor activities than in intellectual activities, but this will depend on age and other factors. If an activity involves any unusual degree of tension, rest periods are to be advised between practice periods, and as far as practicable these should be so spaced that both fatigue and boredom are very largely prevented. Beyond this the teacher will be forced to rely mostly on common sense until experimental evidence is available for the specific learning in question.

Musicians especially often spend long periods in practicing and, as we have already noted, it is not particularly unusual for children to be required to spend periods of two and three hours in practically continuous practice. We do not know with any assurance just what the optimum length of practice periods should be at different ages, and in any case there would certainly be marked individual differences, but it is to be doubted that for children under ten years of age much is gained by spending more than two practice periods of thirty minutes each daily, and probably few adults will gain much by spending more than two periods of one hour each daily. Too much practice tends to cause a loss of interest, and this is not conducive to improvement.

SOME PRINCIPLES OF LEARNING MOTOR ACTIVITIES

Learn through doing. Theory is of some value, especially to the more intelligent students, in mastering motor acts, but the primary emphasis must be on attempting to do the thing to be learned. The idea that "appreciation precedes execution" is not completely true in the motor field. The learner should have a clear appreciation of the end to be attained, but he need not have a clear appreciation of the means used by others to attain the end. The parrot learns to talk without any very clear understanding of what he is doing. The young baby also learns to talk without deliberate effort and without being able to analyze his own responses. *Manicrisms are some-*

times copied both by children and by adults unconsciously. For this reason it is somewhat dangerous to expose a group of children to bad nervous habits such as tics and stuttering. If one child in a room stutters, others may take it up without intending to do so. This shows us that the intellectual factor is not as important in learning motor responses as it is in learning some other things. Consequently, if we may be permitted to use arbitrary figures in order to be more specific, we would say that motor learning should be 90 per cent practice and 10 per cent theory, and, probably after the early stages of learning are passed, the percentage of theory should be further reduced.

Teach correct form, but do not insist on it. Although we cannot say that any one way of doing a thing is absolutely right, some ways are more likely to be successful than others. Hence it is well to teach these better ways of doing things. But, as we have already emphasized, we must be prepared to accept marked individual deviations from what is recommended by the experts. Hence, if a learner does not get results in an orthodox manner but does get them in some other way, accept them.

Aim at unconscious habit. Motor skills should be thoroughly mechanized so that they can be performed without giving thought to the details of the performance. An automobile driver must not have to think how to stop a car when he meets a situation requiring immediate action. The impulse to stop should set off automatically the necessary motor coordinations. Giving thought to the details of the response is very likely to interfere with the smoothness and also with the speed of the reaction. A golf player who thinks very much about how he must make different muscles work is not likely to play a good game. The student taking notes should not have to give thought to his penmanship: he should be able to concentrate on *what* he is writing, not on *how* he is writing. Hence practice should be continued until the act can be performed without attention to details.

It is perhaps worth noting that the introspective psychologists have always had a great deal of trouble with kinaesthetic impres-

sions. The average person has no difficulty in recognizing the ordinary sensory qualities in such fields as sight and taste, but he does have great trouble in analyzing out the sensory aspects of motor responses. Nature has not seen fit to give us the same kind of consciousness of qualities in the motor field that she has given us in the other sensory fields. On the nervous side, the cerebellum is especially concerned with the execution of motor responses, and, so far as we know, it operates without conscious concomitants. There are large kinaesthetic sensory fiber tracts which connect the body with the cerebellum and which do not appear to arouse conscious sensory experiences. In short, our nervous machinery seems to be built to operate with a minimum of conscious attention to details.

Use trial and error and selection. It has been pointed out earlier in the chapter that we cannot deliberately perform novel motor acts. Therefore, we must not assume that we can show a pupil how to do something and that he can then do it at once. Ordinarily if the act is really novel he will have to experiment before he can hit on a satisfactory reaction. Let him, then, experiment, and when he does get something that is satisfactory, try to fix that through further drill.

Try to reduce individual variation in responses. The motor mechanism is somewhat like an unruly wild horse. It persists in doing the unexpected. Before the beginner can become an expert he must eliminate most of this variation. The student who is in the early stages of learning the violin shows this variation by errors in time, by errors in giving his notes just the right pitch, and in other ways. The result is not pleasing to the ear. Only when his responses have become rather precise can he perform acceptably.

An amusing example of this variation is found in the early attempts of musicians to perform together. Some get ahead, some lag behind: one climbs too high on the scale, another slips below. So before bedlam can be replaced by music, individual variation must give way to polished exactness in reactions.

Also in sports, variation in performance must be brought under control before a good game is possible. Many baseball players can

occasionally throw a ball so that it will curve over or near the plate. But only the few can do this with sufficient regularity and control to become successful pitchers. Give the dub in golf fifty balls and ask him to shoot for the pin one hundred yards away. He will scatter them over an acre or more. The expert will bunch the balls rather closely. The more expert he is, the more closely he will bunch them. This principle has been most clearly recognized in rifle shooting, but it holds in other fields as well: skill is associated with regularity and precision in response.

A GENERAL FORMULA FOR TEACHING MOTOR ACTIVITIES

Motor learning may be divided somewhat arbitrarily into seven steps. Another writer might make more or fewer steps, but in any case there are several distinct phases to the complete process.

1. The first step is to give the learner a clear understanding of the objective. In many cases in human learning, this can almost be taken for granted. But when a hungry rat is first placed in a maze he lacks this understanding and hence he simply moves about more or less at random until by chance he happens to arrive at the food compartment. Both children and adults like to know clearly what they are about, and this desire should be satisfied at the beginning of the practice period.

2. Supply examples of the performance. The teacher should demonstrate by writing on the board, by talking a foreign language, by dancing a new step, by using a plane or other tool, by manipulating a calculating machine, driving an automobile, or otherwise giving an example of performance. Moving pictures may be used in some cases to clarify the nature of the activity. Slow-motion movies are especially useful at times. The drill sergeant may have experienced soldiers perform in front of the recruits, and in the beginning, when quick movements are involved, some of these movements may be at reduced time.

One important precaution here is that the person giving the example should normally be facing in the same direction that the learners are facing. If the dance teacher faces the class and demonstrates a step, it is likely to be confusing because the class must

begin with the foot on the side opposite from the one with which the teacher begins.

3. Explanations of technique are frequently called for. The boy trying to learn to throw a baseball so that it will curve will usually be helped if he has a better understanding of the physical principles involved. The same thing applies to various strokes in tennis. This does not mean that a vast amount of theory is to be taught but simply that basic principles are commonly helpful.

4. The learner attempts to do the activity in question. Practice begins. This will be varied according to the activity and the method chosen. The trial-and-error character of motor learning is usually quite evident. Many mistakes are made, but these may be useful to the learner in that they will indicate more clearly some of the responses to be avoided.

General bodily muscle tension is likely to be common even when only a small part of the body is involved in the activity itself. An important part of the problem of learning is to reduce this tension in the parts of the body not required for the activity and to have only as much tension in the proper muscles as is required for the execution of the activity.

The learner is, as a rule, not able at first to execute the movement as desired. Like the child learning to speak, he will usually find it necessary to experiment until he hits on something approaching the correct response. The amount of this experimentation required will vary according to the activity and to the capacity and perhaps also the luck of the learner. The teacher can assist by making an analysis of the learner's difficulties.

5. After practice has given the learner some experience with the activity and has enabled the teacher to study the learner's errors, corrective instruction is needed. The pupil should be shown the nature of his errors and told how to correct them. Additional instruction on form and technique and principles may be called for along with additional demonstration by the teacher. This may tax the ingenuity and understanding of the teacher to the utmost.

6. Steps 4 and 5 are continued indefinitely, for years in many cases, in the form of practice followed by attempts at corrective

adjustment, until the results are satisfactory, or as nearly satisfactory as time and the pupil's capacity permit.

7. Practice must be continued at intervals to maintain skill. The passage of time has less effect generally on motor than on intellectual memory, but skill is impaired unless practice is continued.

Since the curve of motor learning is generally negatively accelerated and approaches a physiological limit, the later stages of practice are progressively less profitable in the sense that improvement on a quantitative basis becomes proportionately less for a given amount of effort. In spite of this the professional concert pianist may feel justified in spending a great deal of time to make a small gain. Under many other conditions the small gain is not worth the effort. For most people exceptional speed and quality in handwriting are not worth the effort required to develop them. A more moderate degree of proficiency is adequate for practical purposes

MOTOR LEARNING IN SPECIAL FIELDS

Handwriting.—The first problem in connection with handwriting is: When should it be taught? Children like to scribble with a pencil and some writing could be taught in the kindergarten. However, with growth and maturation it becomes easier for children to learn to write and for this reason a later date is to be advised. Also, if a group is taught to write at a very early age, as a result of the variation associated with individual differences, some of the children will have exceptional difficulties, but if writing is minimized until about the second grade there will be less trouble on that account. Writing does have some value, however, in connection with learning to read, and for that reason a little writing might be attempted soon after reading is begun.

Form and Materials.—Should we teach manuscript or cursive writing? Manuscript writing has the advantage that the letters are more like printed letters and for this reason would, at first, be less confusing to children. Learning to read and learning to write would tend to supplement each other. Also manuscript writing does not require the continuous smooth coordination required for

the cursive form. If manuscript writing is taught first, a change to the cursive form can be made at about the fifth grade since there seems to be some advantage in cursive writing at later grades. The difference is not very important though, and many college students now use the manuscript form. In the writer's experience at the college level, cursive writing is more often illegible than manuscript writing.

First grade children have learned to do excellent writing with pen and ink. But because of the later development of the fine muscles, it is better to teach beginners to write on the blackboard or to write with a soft pencil on paper. Also they should be permitted and encouraged to write large handwriting. It is easier for them to make letters large than it is to make them small. With age and practice the size of writing can be reduced. The third or fourth grade should be soon enough to learn to write with a pen.

Teaching Procedures.—The old method of teaching writing was to use a copy book and have the child imitate the copy. Experiment shows that this is still a good method and is better than some of the modern devices that have been tried. The copy book model should be supplemented by examples of the process of writing. The child needs to see the hand and arm movements as they occur in the activity.

Letter forms will be gained better by copying from a model than by tracing, although tracing might at times be useful. Permitting the pupil to examine writing scales which show different qualities of writing also is helpful. In this case some of the outstanding differences should be pointed out.

The Left-handed Child.—Experts disagree as to what should be done about the teaching of writing to the left-handed. Some favor teaching all children to write with the right hand. Others point out that stammering and stuttering are more common among the naturally left-handed who have been changed over to the right hand. Statistical evidence fairly definitely supports the latter view.²³ For this reason it is safer to permit the child to learn to write with the preferred hand. Sex and temperament are important factors here though. Many

more boys than girls develop stammering and stuttering, so that it is more of a risk to change the boy to the other hand. Also nervous children are more likely to develop speech difficulties, and for this reason it is especially important that they not be disturbed. If the child learns to write with the natural hand, it seems probable that after writing and speech are established, writing with the other hand can be learned at the age of ten or twelve without special difficulty. When one hand is trained to do a particular task, "cross transfer" occurs, and the other hand benefits to a considerable extent from the training.

One account has been published of a change in writing hands in two girls at about the age suggested, and no speech difficulty developed.¹⁸ If a change were started at this later age and speech difficulties became at all serious, they would normally stop if the practice with the new hand were stopped.

It is at times more convenient to write with the right hand, but the difference is not sufficiently important to make it a major issue. In no case should the change be attempted without the full consent of the child. Forcing a child to learn with the other hand would tend to create emotional conditions that would impair the development of speech.

In activities other than writing, and where speech is not involved, the chief problem is that of efficiency. No great skill is required for the use of knife, fork, and spoon, and there is, therefore, no good reason why the left-handed child should not learn to conform to right-handed patterns of eating: he is less likely to bump elbows at a crowded table! In an activity that requires great skill, however, such as playing a violin or shooting a rifle, there is some reason for believing that greater skill will be developed if the individual learns according to his natural pattern of handedness. In baseball, the left-handed hitter has the advantage over the right-handed hitter in hitting right-handed pitches and in getting to first base, and this may be more than enough to compensate for any loss he may suffer by changing from right-handed to left-handed hitting. In golf it is said that a change from right to left, or vice versa, is actually beneficial in that in using right-handed clubs the left hand is more

important than the right. Whether this is true or not, one of the most successful players is naturally left-handed but uses right-handed clubs.

Stammering and Stuttering.—As noted before, speech difficulties are more common in boys than in girls. Also the statistical evidence indicates that differences in laterality or handedness is an important part of the picture. Children who stutter are more likely to have been changed over from the left hand to the right hand in writing, and they are more likely to have left-handed relatives in the immediate family. However, the fact that relatively few girls develop speech difficulties and that only a minority of the boys develop serious symptoms as a result of the shift in handedness indicates that the problem is more complex.

This aspect of the matter has been emphasized by Dunlap who points out that speech difficulties are a symptom of more fundamental disorders. He also stresses the point that, in general, no one cause is responsible for such difficulties. Hence the treatment of a case of speech difficulty becomes much more involved than a simple case of dealing with an ordinary motor habit. This means that for the best results in difficult cases the services of a trained specialist are required.

Dunlap lists five kinds of causes: primary, determining, predisposing, precipitating, and sustained.⁸ He holds that the primary cause is commonly found in the family situation: there is some frustration without an adequate substitute. Either this needs to be corrected or the individual needs to be removed to a new environment in order to effect a permanent cure. The chief determining cause is improper speech correction. Dunlap thinks parents should set the child a good example, and wait. Especially avoid baby talk. The predisposing causes are malnutrition and physical weakness. Stammerers tend to be vegetarians. An adequate diet of red meat is advised both as a preventive and as a corrective. Physical stamina favors nervous stamina. The precipitating cause of stammering is usually some shock, but stammerers vary greatly in the stimuli that cause them difficulty, and this may be related to the situation which originally set off the trouble. The sustaining causes are those condi-

tions in the environment and in the habits of the individual which continue to produce the speech difficulty.

Dunlap has an important theory of learning which is applied to the treatment of cases of stuttering and stammering. The method based on this theory is called negative practice. The essential idea of this method is that the sufferer practices doing voluntarily the thing that has caused the trouble when it occurred involuntarily. The stutterer learns to stutter so that he can stutter at will, the theory being that if he can stutter at will, he can also voluntarily refrain from stuttering. When this takes place, an involuntary response has become voluntary and hence is under control.

An example in another field may clarify the difficulty. Beginners in golf are commonly troubled by having their drives slice, that is, curve to the right at the end of the drive. This fault sends balls out of bounds, costs money, time, strokes, and temper. One correction is to teach the player voluntarily to hook, slice, or drive a straight ball. When he can do this, he has a better chance of correcting the error occasionally when he chances to lapse into it.

To use the method of negative practice on speech difficulties it is necessary to have the assistance of a trained specialist: the stutterer cannot do the job alone. Otherwise the stutterer is likely simply to develop voluntary control over a new form of stuttering and to continue to stutter in the usual way in response to the usual stimuli.

Dunlap states that stammering will clear up usually if proper conditions are provided before the age of nine or ten. Between that age and fifteen or sixteen most cases are not difficult to cure, but after sixteen the outlook is less promising.

Facial tics, which may also be a symptom of fundamental nervous difficulties, are often found to accompany speech difficulties and are to be treated by the same method of negative practice.

Perhaps one of the most outstanding implications of these studies of speech disorders is the idea that for effective action the individual requires a well-integrated and stable system of responses. A lack of nervous integration will tend to show itself in speech as well as in other forms of erratic behavior.

Physical Education and Athletics.—The understanding of motor responses and motor learning as they occur in physical education activities and athletics can be improved greatly by psychological analysis. This analysis may then be used as a basis for the development of tests of motor abilities and of motor educability, and these tests may be used for sectioning students on the basis of ability and for predicting the success an individual is likely to have in a particular physical activity.

McCloy¹⁶ lists the basic factors in physical education activities as follows: (1) muscular strength, (2) dynamic energy, (3) ability to change direction, (4) flexibility of muscles, (5) agility, (6) peripheral vision, (7) visual acuity, (8) concentration, (9) understanding of the mechanics of the techniques of the activity, and (10) absence of disturbing inhibitory emotional complications. Individual differences in these factors are responsible for a large part of the differences in performances in motor activities.

As definite factors in motor educability, that is, in the capacity for learning new motor activities, McCloy lists the following: (1) insight into the nature of the skill, (2) ability to visualize spatial relationships, (3) ability to make quick adaptive decisions, (4) sensory-motor coordination in the sense of hand-eye coordination, (5) sensory-motor coordination in the sense of adaptation to weight and force, (6) judgment of time, height, distance, and direction, as in throwing a ball, (7) accuracy of direction and small angle of error, (8) general kinaesthetic sensitivity and control, (9) ability to coordinate complex unitary movements, (10) ability to coordinate a complex series of movements, (11) arm control, (12) complex balancing adjustments of the body, (13) timing, (14) motor rhythm, (15) sensory rhythm as in sensing the beats of music, and (16) esthetic feelings.

Different physical activities would require these sixteen factors to different degrees so that an individual who might be a failure in one form of activity might be a success in another. The last three factors, for example, would be especially important in dancing, and a person very weak in those probably would be a poor dancer but might be very capable in some other activity. Through the use

of appropriate tests, teachers in physical education can get a much better understanding of the potentialities of their pupils. Thus some parts of the Seashore music tests give a good correlation with capacity for learning dancing.

One of the important things that could be done through the use of tests is to select those individuals who are especially weak along particular lines and then to give them special remedial work to reduce as far as practicable their deficiencies. Training would not, as a rule, bring them up to normal, but in most cases it would reduce the degree of deficiency. This is the same type of thing that we now do more or less regularly in the teaching of academic subjects such as reading, arithmetic, and spelling. We locate errors and special weaknesses and attempt to correct them.

In the kindergarten and primary school one of the major needs in connection with physical training is diversified equipment which will make possible and encourage diversified activities. These are necessary in order to encourage well-rounded physical development for the reason that different activities bring into use different muscle groups and different coordinations.

Relaxation and Mental Hygiene.—It was pointed out earlier in the chapter that the beginner who is learning a motor activity tends to be tense all over, and that one of the major problems of learning is to develop differential control of the particular muscle group involved in the activity so that the rest of the body can be relaxed while the particular muscle group uses only the amount of energy necessary to do the activity with proper efficiency. Since muscular contraction uses up energy, it is evident that any serious disregard of this requirement of differential relaxation means the useless expenditure of energy. Bodily energy reserves being necessarily limited, it follows that any unnecessary expenditure of energy leads to greater fatigue than is necessary.

Neurasthenia, or nervous exhaustion and fatigue, is so common in this country that it has been called the American disease. Evidently then, as Jacobson has pointed out, here is in part a key to the solution of the difficulty. To avoid undue exhaustion the indi-

vidual must learn to relax and to use only those muscles and the amount of energy necessary for the work he is doing.

Not only muscular activity but emotional excitement is responsible for neuromuscular tension, so that the emotions must also be controlled. However, the control of emotional tension comes partly through the development of the power of muscular relaxation in situations in which emotional excitement arises. The angry man who consciously and deliberately relaxes his voluntary muscles tends to become less angry.

For the foregoing reasons the problem of mental hygiene is to an important degree a problem of motor learning. It is a problem of acquiring differential control over the body musculature and the related nerves so that they work efficiently as required to do a given job but otherwise remain largely relaxed until called into action. This conserves energy and permits the individual to do the greatest amount of work with the minimum expenditure of energy. In this sense the problem of mental hygiene is fundamentally reducible to learning the motor control necessary to conserve body energy.

QUESTIONS AND EXERCISES

1. Apply Herbert Spencer's principle to the development of motor skills. What are the most important features of motor development?
2. How are maturation and learning related in the development of motor skills?
3. What is meant by the statement that there is a pattern of motor development?
4. Why is it important for the would-be violinist to begin training in childhood?
5. How does individuality express itself in motor activities?
6. How do the sexes compare in muscular strength and in motor skills?
7. How does maturation affect motor plasticity?
8. How may we account neurologically for the development of speech defects when left-handed children learn to write with the right hand?
9. How are we to interpret James' statement that we learn to swim in winter and to skate in summer?
10. Compare the forgetting of motor skills and of rote memory materials.

11. Why do motor learning curves tend to be irregular in form?
12. Compare children and adults with respect to fatigue.
13. What is meant by saying that motor capacities are highly specific? What are the educational implications of this fact?
14. How is quotidian variability expressed in the motor field?
15. What recommendations would you make for the motor training of left-handed children?
16. Explain physiologically Jacobson's theory of relaxation. How do his methods help cases of neurasthenia?

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CHAPTER 10

THE DEVELOPMENT OF ATTITUDES

Educational Objectives.—For ages educators have held that the formation of attitudes, ideals, and character is one of the aims of education and in some instances the primary aim. At the present time, much is said about the importance of training in citizenship, which, on analysis, is found to consist largely of the development of certain appropriate civic attitudes and ideals. In contrast, some educators maintain that it is not the business of the schools to emphasize character training and that they serve rather the purpose of imparting knowledge and skills.

One criticism leveled against the advocates of character training, the development of citizenship, sportsmanship, and similar characteristics, is that these aims are too general in character, they are intangible, they are not exactly defined, and they are not subject to measurement. Hence it is not possible to determine whether or not or to what degree they are being attained. Furthermore, in so far as this criticism is valid, it is not possible to work out exact scientific methods of developing attitudes and character, because these methods require some definite goal and some reasonably accurate means of determining progress toward the goal.

Another criticism offered against such aims is that they have little relation to the work actually done by the schools or to the special requirements made for the certification of teachers who do particular kinds of teaching. The elementary schools teach reading, spelling, arithmetic, and other rather definite subjects. Teachers are required to know these subjects and something about how to teach them. At the high school level, the requirements made of teachers in the way of knowledge of subjects are even more definite and extended. To be sure, it is usually hoped that teachers will be of passable moral character, but reasonably discreet and tactful applicants have little difficulty in meeting this requirement.

Are there then any legitimate educational objectives in this field? Most educators would say that there are, but they would not find it very easy to state these objectives in definite terms or to tell us how their degree of attainment is to be measured. It is, of course, not the proper function of psychology to determine what the schools should attempt in this area. Rather it is the function of educational psychology to apply available scientific knowledge, and, when satisfactory knowledge is lacking, to apply the best scientific opinions in order to determine the best methods to use in developing such attitudes and ideals as it may be agreed to attempt to develop.

In the normal course of events, every person develops likes and dislikes for things within his field of experience, and these likes and dislikes have a definite effect on his behavior. He tends to avoid anything that he dislikes and to seek whatever he likes. For this reason, what he comes to like or dislike is of considerable practical importance in determining his behavior.

Likes and dislikes tend to be closely related to interests and to values. The student who learns to like a subject is interested in learning more about it, while the student who has developed a dislike for a subject will tend to avoid it. Each student also tends to evaluate all learning in terms of its apparent relation to his objectives, and he gradually builds up some kind of system of values. He thinks certain things very important and certain other things of little or no importance.

It is rather obvious that an astronomer who spends most of his time doing research must have a set of values that differs considerably from the values of a loan shark. The former must believe it of great importance to advance our knowledge of the celestial universe while the latter seems primarily concerned to increase his own wealth without much regard for the welfare of his customers. In each case, however, behavior is related to attitudes, and in each case it is probable that differences in experience have contributed to the formation of differences in attitudes.

Also, even the avowedly irreligious and the criminal develop some ideas as to right and wrong. Some criminals will die rather than "squeal" on members of their gang. Some professed atheists

take great personal risks in trying to spread their beliefs. Thus without attempting to say what should be considered right and what should be considered wrong, we may recognize the virtual universality of codes of conduct that influence more or less vitally the behavior of the holders.

Since it seems evident that these codes are in large measure the products of experience, we may properly consider the problem as to the methods most likely to result in the acceptance of one set of values rather than another. But in order to obtain the best results in this field, the objectives should be stated in definite form, and means should be developed for determining the degree of attainment of the objectives stated. It is, let us repeat, virtually futile to say that the aim of education is the development of character and then to spend our time teaching reading, arithmetic, and spelling, and then testing our efficiency simply by giving tests in reading, arithmetic, and spelling.

To be more specific, we might set up as examples of desirable objectives: (1) training in emotional self-control to prevent outbursts of anger on slight provocation; (2) training in courtesy in ordinary social situations; and (3) the development of attitudes favorable toward democratic as opposed to autocratic government. Our program of training would then be formulated to attain these and any other objectives that might be considered sufficiently worth while and reasonably attainable.

The Nature of Attitudes.—Attitudes involve some knowledge of a situation. However, the essential aspect of the attitude is found in the fact that some characteristic feeling or emotion is experienced, and, as we would accordingly expect, some definite tendency to action is associated. Subjectively, then, the important factor is the feeling or emotion; objectively it is the response, or at least the tendency to respond. In any case, attitudes are important determiners of behavior. If we are to change them, we must change their emotional components. In order to do this, we may find it useful to change the knowledge and the ideas related to them. Frequently the acquisition of new knowledge with reference to a person, a political party, or an idea will result in arousing new emotional

associations. These, in turn, will lead to new tendencies to action. Thus a farmer may vote for a particular political party because he has been brought up to believe that it is the "right" party. In the course of experience he may learn some things about the policies of that party which cause him to believe that his interests lie with another party. In that case his attitude will probably change. As a result, he may be expected to vote in a different way. Knowledge, attitudes, and behavior are, then, very closely linked.

FACTORS INFLUENCING THE DEVELOPMENT OF ATTITUDES

Maturation.—While the formation of attitudes is unquestionably conditioned by experience, the effect of environmental stimuli is conditioned by prior organic growth. This applies not only to the growth of the nervous system but also to the growth of the entire body. The crippled and undersized boy of sixteen years is unlikely to form the same attitudes as those formed by another boy of sixteen who is large, well-proportioned, and strong for his age. Skin color may not have much relation to the development of the nervous system, but it has a vital effect on social adjustment and attitudes. Age and sex are also, quite obviously, important factors in determining just what attitude responses will be made to a given environmental situation. For this reason, a really comprehensive study of the development of attitudes might involve a detailed study of physical growth and development, including perhaps biochemical changes in body tissues and fluids, for example, sex hormones; but we shall confine our discussion to some brief notes on intellectual and emotional development.

On the more purely intellectual side, attitudes are conditioned by the growth of intelligence. Attitudes are based on perceptual experience, and their development will depend on memory, understanding, and reasoning. The young child has only a very limited capacity for understanding the world about him and he is consequently incapable of forming attitudes about remote, or complex, or abstract things or problems. On the basis of Binet test norms we may, for example, say that at seven years a normal child will observe what is taking place in a picture, but he does not go very far in inter-

preting the reasons for what is happening. Not until about the age of twelve years will he give satisfactory interpretations for simple concrete situations.

Absurdities tests have been included in intelligence tests for mental ages of about nine years and above. These vary from simple concrete situations to those that are more complex. Consider, for example, this version of an old story:

A man was traveling on foot in the far North when he suddenly realized that he was being pursued by ten wolves. He had a rifle, but he had only nine cartridges. When the wolves came near, he shot one of them. The other wolves were very hungry, so they stopped and ate the dead wolf; then they came on again; he shot a second wolf, and it also was eaten; the remaining wolves continued the chase. This kept on until the man had used all of his cartridges and had killed nine wolves, but there was still one ferocious and hungry wolf left. How would the man be able to escape?

An adult of ordinary intelligence will soon understand that this story is impossible, because he will see that after two or three wolves have been eaten the remaining wolves will not be hungry and will not be disposed to travel very far or very fast. A small child may, in contrast, accept the story literally and see no problem in the assumption that the last wolf now contains the other nine.

At about a mental age of twelve years the child begins to understand abstract terms such as pity and justice, and his capacity for both inductive and deductive reasoning shows a marked and continuous increase during adolescence. As a result of this growth in capacity, he becomes able to understand and to react to more abstract and more generalized propositions, ideas, and ideals. This carries over into such fields as economics, politics, and ethics, with the result that the intelligent adult is capable of having a more generalized concern about such questions as the public welfare, or about the ethics of political internationalism, whereas the child is limited to the formation of attitudes of a more particular kind that are related to his own immediate problems and experiences.

We do not yet have a scale of emotional development which is comparable to the Binet scale of intellectual development, but enough

has been done to justify the inference that eventually such a scale for emotional maturity may be developed.

Soon after birth the infant is capable of generalized emotional excitement which may be either pleasant or unpleasant. With increasing maturation, a differentiation in responses occurs both to unpleasant and to pleasant stimuli. On the unpleasant side, we find fear, anger, disgust, jealousy, envy, disappointment, and sorrow. In part, this differentiation must depend on the growth of the body—especially the growth of the nervous system and of the viscera—which makes differential response possible. In part, it undoubtedly depends on the accidents of experience. From this point of view, we must think of the child as developing, with age and growth, the capacity for new emotional experiences and attitudes. At three, the girl who loses her mother is not capable of feeling the grief that normally she would feel twenty years later.

On the pleasant side, there develops, in the course of time, a differentiation between feelings of body warmth, satisfaction of hunger, thirst, sex urges, and the more remote urges such as curiosity, desire for social approval, and desire for achievement. These become specialized in the sense that one is not generally curious but does desire very much to know how much the neighbor's wife spends for clothes. One may not be much concerned about general social approval but may be vitally affected by the opinion of certain people. And here the interest may be quite specific in that one cares for a given individual's opinion with respect to a special thing. The ambitious art student may not be particularly impressed by the instructor's opinions in the field of politics but may be most seriously concerned about his opinions in the field of art.

At the age of four or five years, three characteristics especially deserve mention. These are curiosity, contrasuggestibility, and independence. The child at this age is likely to express his curiosity by asking an endless series of questions. He is trying to understand the concrete world around him, and he consequently bombards his elders with questions as to what things are, where they come from, and how they operate. Some small boys will, for example, learn the movements necessary to operate a car, long before they

are large enough and strong enough to drive. Contrastsuggestibility expresses itself in the form of resistance to adult suggestions and commands. In one instance when a bright boy of five years was being given a Binet test, he would give a wrong answer and then look at the examiner with an amused glint in his eyes. He did not feel it important to make a good score, and he thoroughly enjoyed refusing to cooperate. This tendency, obviously, may present some difficulties in handling children at the kindergarten age. Independence is related to contrastsuggestibility, but it may also extend over into the field of social behavior, with the result that the child may be well satisfied when playing alone. A little girl of five years may, for example, be very happy playing with her dolls and talking to them and may show very little interest in playing with other children. Certainly in many children at this age, the desire for association with other children is much weaker than it is at later ages. Obviously this fact has an important bearing on any educational efforts that may be made to develop better social adjustment at the kindergarten level. In some cases when children at this age show rather anti-social tendencies, they will, if let alone, later become quite gregarious.

During the first two or three grades in the elementary school, the child is developing more social interest, but he is too much of an individualist to work very well with groups until the age of eight or ten years. Then he becomes able to work with groups if the groups have adult leaders, but he will need several years of additional development before he is able to work very well in a group with a leader of his own age. This is reflected both in the formation of boys' gangs and in team sports. Gangs have little importance before the early teens, and the kind of teamwork that is required for playing baseball and football is not found to any great extent at the elementary school level. Younger boys will play ball, but too many are likely to want to bat or to pitch at the same time. If, then, we are to emphasize the principle of readiness in the teaching of attitudes, we shall probably find it wise to wait until adolescence to put much emphasis on the development of higher forms of social adjustment.

At about the age of ten or twelve years, there is an increase in self-confidence which is associated with a tendency to criticize older people, both parents and teachers. This tendency disturbs some parents greatly, and it may make the life of a teacher a very unpleasant one. It makes discipline more difficult from about the fifth grade through the ninth grade than during earlier and later grades. This period is, consequently, hardly the best time to attempt to teach the virtues of respect for authority.

Adolescence is marked especially by the maturation of sex emotions and by the development of altruism and cooperativeness. These in large measure furnish the basis for the formation of attitudes that differentiate adults from children. Boys at the age of twelve years may have a distant interest in girls, and they may even have crushes on particular girls, but their interest is quite different from what it will be some years later. Adult males may be interested in reading romantic fiction, but pre-adolescent boys would very often find such literature disgusting. Here again, then, the principle of readiness suggests that the elementary school is hardly the place to attempt to develop certain attitudes that may be important when the sexes reach the courtship level. This statement also seems to hold for altruism and cooperation. Higher levels of moral behavior seem to require a high level of emotional maturation before they are possible.

Just as intelligence tests have shown that children of the same chronological age differ greatly in mental age, it seems probable that there are great differences in rates of emotional maturation. There are, for example, marked differences in the interest manifested in the opposite sex by fourteen-year-old girls. Some girls are married before that age, while others show very little interest in boys and men until a later age. There are probably similar differences in the development of other emotions.

It seems that there are also some important sex differences in the development of emotions. Girls mature physically earlier than boys: girls at six, twelve, and eighteen have reached about the same level of physical development as boys of seven, fourteen, and twenty-one. In other words, girls mature physically about one-sixth faster

than boys. There is probably a similar difference in emotional maturation, but satisfactory scientific evidence on this question is not now available.

As an example of specific sex differences in personality and attitudes we may cite a study made by Tryon.²⁴ She found that at the age of twelve the average girl wished to conform to adult standards and to be ladylike; but by the age of fifteen the characteristic desire was rather to be attractive to men and to be considered a good sport. Certainly this is hardly what would be found in a comparison of boys at twelve and fifteen!

Another important sex difference is shown by the Allport-Vernon Study of Values. On this test, males receive higher scores for theoretical, economic, and political values whereas females receive higher scores for aesthetic, social, and religious values. Quite obviously these and other sex differences in interests and in values will have an important effect on the results of instruction.

Sex differences in rate of emotional development, and in specific interests and values, present a problem for which there is no easy solution. Separate high schools and colleges offer one solution, and separate classes in co-educational schools offer another one, but either solution is economically impracticable in smaller communities. A more feasible method of dealing with the problem is to make somewhat different assignments in social science and in literature and to have at least a few meetings for each sex separately to discuss topics that would not be well adapted to the other sex.

Intellectual maturation and emotional maturation are positively correlated in that children who are selected on the basis of superior intelligence are judged to be superior, as a group, in social and emotional development as well. The correlation does not seem to be particularly high, however, and, in harmony with the principle of statistical regression, R. L. Thorndike²⁵ found that a group of children who had been selected on the basis of high IQ's had fewer fears and worries than average children but were not as mature in judgments or in interests as average children of the same mental age. On the same basis, a group of children selected for low IQ's might be expected to have judgment and interests of a more mature

level than average children of the same mental age. If, then, children are classified on the basis of IQ, we should not expect to find that at any given chronological age the superior would be as ready to acquire high level attitudes as they are ready to solve difficult intellectual problems.

Physical Factors.—Clinical psychologists have generally recognized that physical health and vitality are important factors in determining adjustment; and frequently it has been found that malnutrition or disease or accidents have interfered so seriously with normal development that serious behavior disturbances have followed. This factor appears, for example, in a study of "Outsiders" by Northway. By the use of sociometric methods, eighty children in grades five and six were ranked for social popularity, and the lowest ranking fourth of these were classified as "Outsiders." *

These least popular individuals are described as follows¹³ (p. 12): "They are listless, lack vitality, usually under par physically, either below normal in intelligence, or ineffective in the use of the ability they have; careless in appearance, care of possessions, work habits; lack interest in people, activity or events of the outside world. They seem to exist rather than live. . . ."

It seems evident from this description that low vitality is an important factor in producing poor social adjustment; and poor social adjustment will inevitably have an important effect on the formation of attitudes in many different directions. Such children are much more likely to have anti-social attitudes and are less subject to group influences in the formation of other attitudes.

From other studies we may infer that malnutrition and disease are to a considerable extent responsible for these cases of low vitality, and, if this interpretation is correct, it is evident that the classroom teacher cannot be expected to succeed in the development of normal social and other attitudes until the underlying organic deficiencies

* In this case the method used consisted of asking the children for their choice of associates in four actual school situations. In each of these they were asked to list three choices in order of preference. These choices were scored 5, 3, and 2 points for first, second, and third choices, respectively. The total point score of each child was then used to determine degrees of popularity. On this basis the children in the lowest quartile were called "outsiders." They were least often selected by other children as desirable associates.

have been corrected. This is a problem for physicians and nutritionists; but the teacher may often be of assistance by helping to locate such cases and by referring them to the proper agencies.

Home Influences.—It is generally accepted that attitudes are determined largely by the social environment and that home influences are especially important. In a study of intra-family similarities in attitudes, Newcomb and Svehla¹² compared parents and children on Thurstone's scales for measuring attitudes toward the Church, toward war, and toward Communism. Correlations between the parents were highest, those between parents and children were next, and those between siblings were lowest. The high correlations between parents probably result largely from assortative mating, in that people tend to select marriage partners who belong to the same cultural group and to a large extent have the same attitudes at the time of marriage. Also, to a considerable extent, living together and having the same experiences should tend to increase the similarities in attitudes. The fact that the correlations between siblings are lowest suggests, to some extent at least, the importance of outside social influences.

Parent-child correlations were highest for attitudes toward the Church (.51-.69) and lowest toward war (.34-.46). There were also some sex and other group differences. War was opposed more by women and girls than by men and boys. Parents tended to be more constructive than children, and sons tended more than daughters to resist family influences. This difference may, however, have been due largely to the fact that sons tend to be exposed to a greater extent to outside influences.

The Social Environment.—The home environment is of primary importance in the formation of early attitudes, but friends, associates, and the general social environment come to have an increasing influence as the child grows older and has wider social contacts. Adolescents and adults become members of various social clubs and other groups and are exposed to the opinions, attitudes, and mores of these groups. It is through these contacts, as well as through the home, that the individual acquires a large proportion of his attitudes, stereotypes, and prejudices.

A church group, or a social club, or a college community may come to have a particular kind of emotional and intellectual atmosphere, with the result that the individual who accepts membership in the group also tends to appropriate the characteristic attitudes of the group. These group influences are very strong in case of some attitudes, and, in case the schools attempt to develop attitudes that are opposed to such group-supported attitudes, the results are not likely to be encouraging.

However, a school may develop a spirit of its own, and, in that case, the group attitudes in the school may have a very great effect on the attitudes of new students. This is shown, for example, in a study made by Newcomb¹¹ (p. 28). He found a general tendency for students in one college community to change in political attitudes from the freshman to the senior year. On the basis of straw votes at the time of the 1936 national elections, it appeared that 62 per cent of the freshmen and only 15 per cent of the juniors and seniors supported the Republican candidate. The corresponding figures for the Democratic candidate were 29 per cent and 54 per cent, while the corresponding figures for the Communist and Socialist candidates taken together were 9 per cent and 30 per cent. Similar shifts in opinion were noted in other years. Most of the freshmen considered themselves less conservative than the majority of their class and most of the upper classmen considered themselves more conservative than the majority. It was further noted that these changes did not seem to be related to the particular courses taken or to the books read, but rather, according to Newcomb's interpretation, they depended on the kind and direction of social relationships.

School Government.—The form of the school government seems to be an important factor in determining attitudes both toward government itself and toward other things. In an experimental study, Lewin and Lippitt¹⁰ concluded that there were more tension and more evidence of egocentric feelings in a group under autocratic control, whereas there were more cooperative endeavor, more expression of objective attitudes and of praise and friendliness, and more constructiveness in a group with democratic control. If, then, democratic government is really effective, the general result is an

atmosphere that is favorable to the development of desirable social attitudes. At the same time, it is probably true that the teacher will require more skill to develop an effective democracy than an effective autocracy.

Moving Pictures.—Attendance at moving pictures constitutes another important possible influence in the determination of attitudes. In a comprehensive study of the effects of films, Peterson and Thurstone¹⁴ concluded that films definitely change social atti-

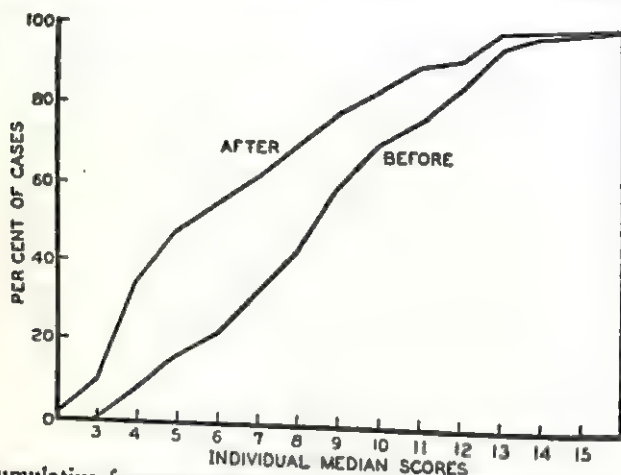


FIG. 29.—Cumulative frequency distribution for the scores of high school children on a scale of attitude toward the Chinese. This was given before and after seeing the film, "Sons of the Gods," which is favorable toward the Chinese. A low score indicates a friendly attitude. Adapted from Peterson and Thurstone (14, p. 19).
By Courtesy of the Payne Fund, New York.

tudes, although only about 10 per cent of the attitudes studied seemed to be affected by movie attendance. The changes in attitude toward the Chinese produced by seeing a pro-Chinese film, "Son of the Gods," are shown in Figure 29. No differences were found in persistence, self-control, honesty, or in moral knowledge between those who attended frequently and those who did not. However, the frequent attenders compared somewhat unfavorably with other children, but the reasons for this difference were not entirely clear. Selection may have been a factor: the children who attended more movies may have had a somewhat less favorable social and cultural environment.

Other and more recent studies of the effects of comic books, serial radio programs, and television, as well as attendance at moving pictures, have usually not shown any marked difference between children who rarely engage in such activities and those who engage in them a great deal, and the differences found may be due largely to differences in the home and to other social influences. However, there is a very widespread opinion that movies, television, radio programs, and comic books do have an important influence in determining attitudes. Children, and adults as well, tend to identify themselves with the heroes and heroines of the screen and radio programs, and, for that reason, it is inevitable that many attitudes will be influenced by such experiences.

The Teacher.—Brown⁴ asked 300 graduate and undergraduate students in Educational Sociology to evaluate the various factors in their school experience that had been influential in the formation of personality and character traits. According to their judgment, the personalities of their teachers had been the most important single factor: 65.3 per cent thought this influence had been good, but 33.3 per cent thought it had been unfavorable. Only about 10 per cent did not consider the teacher's influence important.

In line with this emphasis on the personality of the teacher, the group recommended that teachers be selected more on the basis of personality and love for children and less on the basis of mastery of subject matter. They also recommended that closer and better relationships be developed between teachers and pupils. However, if this last recommendation is to be met, it is evident that classes must be kept small, because the teacher who has too many pupils cannot be expected to give much attention to individuals.

Probably more attention should be given to student opinions of teachers in determining retention and promotion, for the reason that teachers who are disliked by students are very unlikely to have a favorable influence on the development of student attitudes.

The Curriculum.—Thorndike²² asked 155 teachers to rate eleven subjects and activities on the basis of what they considered the value of these to be for the training of character. The most

valuable was rated 1, and the least valuable was rated 11. Median ranks were then determined to the nearest one-half rank. The results are shown in Table 4.

TABLE 4. COMPARATIVE MEDIAN RANKS OF SELECTED STUDIES AND ACTIVITIES (THORNDIKE, 22)

<i>Subject or Activity</i>	<i>Median Rank</i>
Teaching	2.
Athletic sports	2.5
English literature	3.5
History	4.5
English composition	6
Science	6.5
Skilled labor	7
Algebra	8
Geometry	8.5
Latin or other language	8.5
Unskilled labor	9

Teaching has the highest rank, but athletic sports come next. English literature and history have the best ranks for the regular school subjects; mathematics and foreign languages are ranked much lower. This indicates that, in the opinion of this group of teachers, literature and the social sciences have more influence than other subjects on the determination of attitudes. This seems a reasonable view and it suggests that the units of work and the readings in these areas should be selected with particular reference to their probable influence on the attitudes formed by the students.

As an example of this principle, we may consider the teaching of military history. It has been pointed out that conventional history textbooks place relatively more emphasis on wars than on peace-time activities, and that they give much more space to the exploits of military heroes than to the accomplishments of civilian leaders. At the same time, there has been a strong movement for international peace. Without discussing the fundamental merits of this situation, it may be pointed out, on purely psychological grounds, that in pro-

portion as teachers, textbooks, and the general public eulogize the achievements of military leaders and neglect the achievement of those who render outstanding services in civilian life, to that same extent, war is being encouraged. Youth wishes to achieve social distinction and will not be too much opposed to war as long as it offers an opportunity for personal glory. If, therefore, we wish to develop real opposition to war, we shall be more realistic and more likely to succeed if we place more emphasis on the evils resulting from war and at the same time give more credit to outstanding accomplishments in civilian life.

In Brown's survey,⁴ which has already been cited, the curriculum came off rather badly as an influence on the formation of character. Only 16.7 per cent thought it had been beneficial, while a slightly larger percentage, 17.7, believed the effect of the curriculum had been unfavorable. This result indicates that, in most instances, attitudes are relatively little influenced by whether a student registers for French, or mathematics, or history, though doubtless some specific differences in attitudes would be produced by such course differences.

In this same study, extracurricular activities fared somewhat better than the curriculum: almost as many (16.3 per cent) thought the influence of the activities program had been favorable, while less than half as many (8.3 per cent) thought the effect had been unfavorable. This finding suggests that, in relation to the total time spent on the curriculum and on extracurricular activities, the latter are more effective in developing personality, character, and attitudes.

Teaching Methods.—One of the categories in Brown's study was "manner of presentation" of subject matter. This was judged to have had a favorable effect by 8.0 per cent of the students and an unfavorable effect by 17.7 per cent. Evidently, therefore, there was room for the improvement of teaching methods!

As an illustration of procedures successfully used in changing a specific attitude we shall use a quotation from Starr²⁰ (pp. 285f):

Let us take the problem stated previously; namely, that the preparation of lessons is considered bookish and frowned on by

the student body. To fail students or to threaten them will not develop school morale which is conducive to study. The following method has been tried with much success along this line: Various features such as visual education, field trips, maps, better textbooks and supplementary materials were added to the courses to provide interest. Assignments were carefully given to require a fair but not excessive amount of work. Standard and state tests were given to provide a comparison with other schools. Encouragement and credit were given for good showings. The importance of the subject was discussed by teachers, others on the faculty, and outside speakers. Students who graduated from the local school and were attending colleges were invited to speak. Gradually a changed attitude towards school work was discernible. Students took pride in their work and considered it the proper thing to prepare each day's lesson.

School morale is not a mental state which can be injected into the student body as a *shot* given in the arm by a physician; but must be developed by indirect method in a gradual, evolutionary manner.

From this statement it appears that a change in attitude was produced as a by-product of considerable experience in dealing with different aspects of a situation. The attitude was not taught directly as facts may be taught. In agreement with this view, we may cite a statement by Jersild and Holmes⁹ (p. 102) on methods of overcoming children's fears: "Steps taken to forestall fear are likely to be more effective if introduced unobtrusively and as a functional part of other projects and topics than if an abrupt or direct approach is employed."

In much the same spirit, Amis¹ (p. 246) suggests a method to be used to develop an attitude favorable toward democracy:

The emphasis in teaching democracy should be on the development of the individual's ability to think and on finding means of liberating and enlarging thought. The things for which democracy stands and an understanding of the tradition of its development should be a natural outgrowth of comparing life conditions of the student and persons living under other conditions.

No formulae, no technique, can be developed that will teach democracy, except as we offer opportunity for living democratically in an enriched environment, which offers opportunity for

unbiased reasoning and sound physical, social, emotional and intellectual growth.

This is perhaps the most important principle of teaching method in connection with the development of attitudes: avoid a direct approach; use indirect suggestion; or provide experiences that will naturally tend to result in the desired attitude changes.

In one instance in which a new employee wished to influence an executive to make a certain change, the new man was cautioned by an older employee not to suggest the change directly but rather to raise the problem, to present certain relevant facts, and to leave it to the executive to think over the implications of the facts. This was done, and in due course the executive called in the new employee and announced that he had decided on the change that the employee had desired. An indirect attack succeeded here where a direct attack would probably have failed.

Human nature is, however, much the same, whether it is executive human nature or pupil human nature. As Snygg and Combs²¹ have emphasized, our attitudes toward things are very largely conditioned by our desire to preserve or to enhance our feelings of self-esteem. When a teacher makes a direct suggestion that is outside the realm of demonstrable fact, the result is too often the arousal of contra-suggestibility on the part of the pupil, and, when, as must often be the case, the pupil dislikes the teacher, it is all the more probable that the suggestion will be rejected—possibly in favor of an opposite idea.

But even if a teacher is *persona non grata* to a student, a problem may be raised, certain readings may be assigned, films may be shown, selected activities may be engaged in, and the topic may be discussed by the class as a group with a free expression of student opinions and reactions. In this case, if the work has been well planned, and if the teacher has kept her own opinions and attitudes in the background, a group as a whole may be expected to develop the desired attitudes. Furthermore, the impact of class opinions and attitudes on recalcitrant students is likely to be much greater than the effect of a teacher's attitudes. A particular pupil may be

quite willing to disagree with his teacher, but he will be much less willing to reject the attitude of his own age group.

This fact suggests a second principle of procedure, namely, that better results will usually follow if the teacher can develop group support for, and expression of, particular attitudes. In general agreement with this idea, Crow⁵ suggests that one period weekly be given over to home-room programs devoted to the development of attitudes, and that group discussions, questionnaires, skits, and other related procedures be used to afford a basis for developing and organizing group attitudes.

It is psychologically essential that primary emphasis be placed on changing the attitudes of groups, for the reason that attitudes are so largely conditioned by social influences; the individual tends to accept whatever his group accepts and to reject whatever his group rejects. This is true even of scientists. Psychologists, who should be familiar with the nature of the mechanisms of propaganda and of fashion, show a tendency to behave in the field of ideas and attitudes in ways not too dissimilar to feminine behavior in the field of fashion. This is reflected in the rise and fall of psychological schools and in the changes in attitudes toward such problems as instincts, race differences, the constancy of the IQ, and the proper place of introspection in scientific psychology.

Astute and successful political leaders are very careful to "lead" from a point that is not very far from the opinions and attitudes of the mass of the voters. If would-be leaders have ideas and attitudes that are too far advanced, they fail to succeed as leaders. The real pioneers, who promote new ideas and new attitudes that are far removed from those that are generally accepted, are unlikely to have much immediate success. The same principle holds in the field of education: teachers who wish to be successful in developing attitudes will find it advisable to direct their efforts toward the attainment of reasonable goals.

Another kind of evidence of the relation of attitude formation to experience is found in the national differences in tastes with reference to foods and drinks. The French drink wine, the Germans drink beer, the English drink tea, and the Americans drink coffee.

These and many other likes and dislikes seem to be largely matters of habit, custom, and continued experience. The Swiss love their rugged mountains, the desert dwellers become attached to desert scenery and living conditions, while natives of the fertile lowlands dislike both mountains and deserts. This suggests the principle that attitudes and appreciations will very often develop slowly and that a great deal of experience must be provided as a basis for changes in attitudes. For this reason we are not likely to be successful in bringing about much development of attitudes and appreciations in short periods of time.

It is probably generally easier to develop attitudes positively than negatively. It is, for example, probably more effective to develop a liking for democratic government than to attempt to develop a dislike for Fascism.

It is largely for this reason that punishment is often ineffective. Punishment attaches a hazard to the doing of something that is considered desirable, and although the inhibition may be necessary and effective, it is likely to leave the individual unhappy and rebellious. When practicable, it is therefore much better to develop a liking for some substitute form of response which will effectively replace the objectionable behavior. This has been done, for example, by asking a disorderly pupil to assist in obtaining better order.

A further and most important factor to consider in connection with any program aimed at the development of attitudes is the impact of the program on the feelings of self-regard of the students. Each individual is disposed to be jealous of his own status. Orientals are reputed to give a great deal of attention to the preservation of "face" in their dealings with others; and, although Occidentals do not stress the matter so openly, they, both adults and children, are probably equally interested and concerned with preserving their own "face," though they may give less thought to the feelings of others in this respect.

Each person tends to accept attitudes that enhance his status and to reject those that lower his status. For this reason, patriotism is relatively easy to develop. Each person is happy to believe that *his* country is worthy of his devotion. On the same basis, however, it

is not easy to change a feeling of racial superiority in a race that considers itself superior, because this would involve a lowering of the individual's relative status.

It is largely for this reason that many social, political, economic and religious problems are very difficult to handle in such a way as to bring about changes in attitudes. Each individual is likely to feel that a particular church or political party or social group is *his* group, and he consequently resists any suggestion of a change that threatens to lower his status.

The writer once heard a story which illustrates this principle. According to this report, an eminent professor of economics in a large university taught free trade to his students for many years but made few converts. The explanation was that most of his students came from good Republican homes where it was believed that their superior economic position depended on a high protective tariff. Under these conditions, a theory that favored free trade was not acceptable because it threatened a lowering of the individual's economic status.

This principle covers one of the chief reasons why sarcasm and derogatory personal remarks are so fatal to good relationships between teachers and pupils. Sarcasm tends to deflate the individual's ego and to hold him up to ridicule in the eyes of his fellows. It is consequently one of the surest methods of developing bitter hostility, and, when this has happened, that particular teacher has rather thoroughly destroyed her chances of having further favorable influence on the pupil in question.

"Outsiders" and Delinquents.—We have seen that attitude formation is very largely conditioned by social influences and particularly by group memberships and individual friendships and associations. But inasmuch as there are wide variations in the extent to which different individuals belong to groups and have social contacts with other individuals, it is obvious that there must be very wide differences in the extent to which social influences affect the attitudes of different individuals. Social "outsiders" as defined by Northway¹³ are lacking in normal group memberships and in individual friendships and so will be less affected by group attitudes

in general and particularly by changes in group attitudes that may result from school experiences and activities. Delinquents are largely in the same category. They do not conform to the patterns of behavior that are required for normal group memberships, and consequently they are much less subject to group influences in the field of attitude formation. They tend rather to form anti-social attitudes.

For this reason, success in producing attitude changes in delinquents, or in other social "outsiders," will depend to a considerable degree on first getting these individuals included in and accepted by normal groups. In actual practice, it has been found that one of the most successful methods of reforming delinquents is by removing them from their previous environment and placing them in a new environment with desirable activities and companions. In the school situation it will be necessary in each instance to make an analysis of the reasons for non-inclusion and attempt to correct the causes. This may include a wide variety of measures varying from improvement in health to the curbing of objectionable behavior traits; but, in any case, this is a necessary preliminary to really satisfactory development of social attitudes. An individual is unlikely to acquire the attitudes of a group to which he does not belong.

Evaluation.—Published attitude scales may be used as a partial means of evaluating changes in attitudes when suitable scales are available. When they are not, the teacher may use simple scales constructed for that purpose. The simplest method is to ask that a check be made on a horizontal line which has been labeled somewhat similarly to the chart shown on page 308.

When such scales are used, more honest answers will be secured in many cases if the papers are unsigned. A student who, for example, has a very favorable attitude toward Communism may not be willing to let this be known when he believes that his group is opposed to Communism. This is, of course, one of the important reasons for the secret ballot in case of political elections.

Carefully planned essay examinations will very often afford opportunities for the expression of student attitudes, and the same

may be true of student discussions. When a class discusses a topic freely, there is likely to be a rather honest expression of attitudes by many of the participants.

A SCALE FOR MEASURING ATTITUDES

Directions: Please place a check mark on the line after each of the numbered items to indicate your reactions

		<i>Strongly Opposed</i>	<i>Opposed</i>	<i>Neutral</i>	<i>Favor- able</i>	<i>Very Favor- able</i>
1.	Public opinion polls					
2.	High tariffs					
3.	Prohibition					
4.	Communism					
5.	Coeducational col- leges					
6.	The closed shop...					
7.	Socialized medi- cine					
8.	The death penalty.					
9.	Subsidies to farm- ers					
10.	School classification by IQ					
11.	The initiative and referendum					
12.	Universal military training					

Interviews that occur during the process of counseling afford another good opportunity to obtain expressions of individual students on particular questions. When the relationship between the

teacher and the student is good, students are usually willing to talk rather frankly even though they may not be willing to do so in a class group.

In addition, an alert teacher can learn a great deal about student attitudes by attending to their casual conversation and to their behavior. Under "behavior" in this sense we may include such items as books and magazines read, courses taken, scholastic achievement, extracurricular activities engaged in, and general social behavior. At best, however, the evaluation of attitude changes will generally be less accurate than the evaluation of achievement in the mastery of conventional subject matter.

Open-minded Experimentation.—In concluding this chapter it is important to emphasize the point that we now know a great deal less about the best curricula and methods for developing attitudes than we know about teaching facts and skills. This has been well stated by the Committee on the Relation of Emotion to the Educative Process ¹⁵ (p. 93):

Courageous experimentation is needed until educational curricula are found which will lower markedly the incidence of delinquent and pathological behavior, which will impel children to want to go to school instead of desiring to avoid it. A hunch suggests that schools must offer a challenge to children rather than the soft pedagogy of letting them do as they wish.

QUESTIONS AND EXERCISES

1. What are the chief difficulties encountered in attempting to plan a scientific program for training in attitudes?
2. How are attitudes and behavior related?
3. How may emotional maturation influence the development of attitudes? Give examples.
4. How may intellectual maturation influence the development of attitudes? Give examples.
5. How may sex differences in maturation affect the development of sex differences in attitudes? How may this become a problem in education?
6. How may physical characteristics affect the development of social attitudes?

7. How important is the home in the determination of attitudes? Justify your answer.
8. How important is the school in the determination of attitudes? What evidence can you offer to support your answer?
9. Compare the effects of democratic and of autocratic school government on the development of attitudes.
10. To what extent do moving pictures affect attitudes?
11. Would it be scientific to hold that the difference between the attitudes of those who attend movies regularly and those who do not are produced by the movies themselves? Justify your answer.
12. What have studies shown about the effect of the teacher's personality on the development of attitudes?
13. How do the different school subjects affect the development of attitudes and character?
14. Outline a program for changing the attitude of a student body in some particular respect.
15. What practical steps may a teacher take to reduce the probability that the social "outsiders" in her class will become delinquents?

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CHAPTER 11

STANDARDIZED TESTS AND THE SCHOOL TESTING PROGRAM

Standardized tests in psychology and education represent one of the most important developments in modern educational psychology. These tests make it possible to obtain more objective and more accurate information about students and to do this more quickly than was previously possible. They make it possible to compare the performances of individual students and to compare the average performances of the students in school systems with national norms. This is often of value in evaluating the work of the schools and is of great potential value in connection with student guidance.

Standardized tests may be divided into four types: intelligence tests, prognosis tests, achievement tests, and personality tests. We shall consider each of these in turn; but before doing this we should first consider some of the essential characteristics of standardized tests.

TEST CHARACTERISTICS

Validity.—A test is valid in proportion as it measures what it is supposed to measure. A foot-rule is a valid measure of length or of height but cannot be used to measure weight or beauty. This is simple and obvious in case of the foot-rule, but in the field of psychological and educational measurements the validity of a test is usually somewhat indeterminate. The reason for this is that we do not have any universally accepted definition of intelligence, or of achievement in school subjects, or of personality traits, nor can we get any perfect criterion of these with which we might compare any set of measurements to determine the validity of a given test. This is a very serious theoretical weakness in our standardized tests, because it means that the validity of the best tests is always to some

extent a matter of opinion. Consequently, the way is open to serious disagreements as to the meaning and significance of the results that have been obtained by the use of standardized tests, and, as a matter of fact, it has frequently happened that different psychologists and educators have accepted test results as empirical facts but have interpreted these results in quite different ways.

Reliability.—The reliability of a test depends on the extent to which two applications of the test agree with each other. All measurements, however, are subject to error. This is true even in such exact sciences as physics and chemistry, but in the physical sciences the errors of measurement tend to be relatively small, whereas in educational psychology they tend to be relatively large.

The possibility of relatively large error is not to be construed as an argument for not using tests, however, because we cannot very well avoid making judgments as to differences in pupils, and, when we make judgments without using tests, the errors are likely to be even larger than when tests are used. It is rather an argument for improving our present tests, for using the available test results with proper caution, and for supplementing test results with such other data as may have a bearing on the problem.

Reliability may be determined by making two sets of measurements of the same thing and then correlating these pairs of measurements. If the measurements were to agree perfectly the correlation would be 1.00. If there were no agreement except what would result from chance, the correlation would tend to be 0.00.

Since a student is likely to profit from the experience of taking a test, it is usually preferable to give two equivalent forms of a test rather than to repeat the same test. However, two forms of a test are never precisely equivalent and this is one source of error. Reliability may also be determined by what is known as the split-half technique. In this case only one test is given. It is then divided into two approximately equal parts. The odd-numbered items may be taken as one half of the test and the even-numbered items as the other half.

Reliability is also influenced by the length of the test: the longer the test, the higher the reliability. Consequently, when the split-half

technique is used, it is necessary to make a correction for the length of the test in order to estimate the reliability to be expected for the entire test, and this correction can be made by using appropriate statistical methods.

Test-retest reliability is greatly influenced by the time interval between tests.²⁴ This is partly due to the fact that different people forget at different rates, and to other changes in intelligence and in personality that occur with age and time. In general, the longer the time interval between tests, the lower the agreement, and, for this reason, a distinction should be made between reliabilities determined from a single test, or from the administration of two tests at the same time, and reliabilities determined by repeating tests after an interval of time.

Reliability is also influenced by the variability of the group tested. Correlations tend to increase with increases in group variability. For this reason, we expect the obtained reliability for a test given to a single grade, say the sixth, to be lower than the reliability of a test given to several grades, for example, grades four through eight. When the split-half technique is used, a good intelligence test or achievement test may have a reliability of .98 or higher, if based on several grades; but the same test may have a test-retest reliability below .80, if based on tests of a single age or grade, and if given with an interval of several years between tests.

A more satisfactory way of expressing test reliabilities is in terms of standard errors or of probable errors of measurement. This is not the place to attempt a complete explanation of these terms, but simple rules for interpreting them may be given. The standard error of measurement for an average intelligence test is perhaps about seven IQ points. This standard means that about 68 per cent of the IQ's determined will have errors that are less than seven points. But the obtained IQ's may be in error up to as much as about three standard errors, or 21 IQ points.

Errors of measurement tend to be distributed in the form of a normal curve, with a majority of the cases close to zero and with a decreasing number of cases as the distance from zero increases. This means, fortunately, that there will be only a few very large errors,

but it also means that in large groups there will generally be some serious errors.

The probable error is found from the standard error by multiplying the latter by .6745. This makes the probable error of an ordinary intelligence test about five IQ points. Fifty per cent of the errors are normally less than one probable error, so that half of the IQ's obtained will be in error by less than five points. In order to avoid the use of fractions, the practical limit of unreliability is taken as four P.E.'s. Four times five points makes twenty points, and this is about the largest error that is likely to be found for an ordinary IQ. In rare cases, however, when conditions are exceptional, errors may be larger. Specifically, the tester may make an error in arithmetic that will produce an error in the IQ of great magnitude. Regrettably, such errors occur too often.

Applied to an individual case, this means that when a pupil is given a single intelligence test and as a result is rated with an IQ of 90, the chances are fifty-fifty that the true IQ is between 85 and 95. But the true IQ may be as low as 70 or as high as 110. Only by giving additional tests and by correlating test performance with other indications of intelligence, or of the lack of intelligence, can we arrive at a more certain estimate of the pupil's capacity. This is one of the most important things that the student needs to learn about standardized tests. All of these tests are subject to errors of measurement, and most of the measurements made are in error by some amount. For this reason, when Pupil A is assigned an IQ of 90 and Pupil B is assigned an IQ of 100 it is entirely possible that Pupil A may actually be more intelligent than Pupil B. In fact, it is possible that their true scores are the reverse of the obtained scores: Pupil A may really deserve 100 and Pupil B may deserve only 90.

Because tests are inaccurate, experienced counselors try to obtain all possible evidence of a pupil's capacity and ability before arriving at a judgment. Home environment, health, sensory defects, past school training, including changes in schools, special disabilities, as in reading, and interests and activities, all are important in attempting to determine the true capacity of a given pupil.

Equal Units.—The inches of the ordinary foot-rule are equal. The years of mental age scales are probably not equal. Probably growth from age three to age four is much more rapid than from age ten to age eleven. On this basis, the year of mental age would decrease in value from early years to later years. Because of this, although the mental growth curve for the Binet tests seems to be approximately a straight line, the true growth curve for intelligence is probably negatively accelerated.¹¹ This means that it rises rapidly at first but that the rate of growth decreases with age. Because the rate decreases we speak of negative acceleration; if the rate increased we would say that the curve showed positive acceleration.

Test Zero.—Ordinary physical measurements, such as height and weight, are expressed in terms of scales with true zeros. If a child is 35 inches tall and a man is 70 inches tall we can say that the man is twice as tall as the child. Most of our psychological and educational tests, however, do not have true zeros. In other words, a zero score on them does not really mean that the pupil has no ability at all along that line. A student may make a zero on a reading test intended for college sophomores and may nevertheless have considerable reading ability. Similarly a person might make a zero on an intelligence test, such as Army Alpha, and still have intelligence of at least the imbecile level. For this reason we are generally not justified in comparing test scores by use of multiplication or division. If we find that the average soldier in one state received a score of 40 on Army Alpha and that the average soldier in another state received a score of 80, this does not show that the soldiers of the second state are twice as intelligent as the soldiers of the first state. Consequently, when John receives a score of 40 on an achievement test and Mary receives 80, it probably does not follow that Mary actually knows twice as much as John about the subject.

This is one of the reasons why the old percentage marking system fell into disrepute. A passing mark of 60 or of 75 did not actually mean in practice that a pupil must have a knowledge of the subject that was 60 per cent or 75 per cent of a perfect knowledge. One instructor might give an easy test and another instructor might give a very hard test with the result that 75 per cent on the first test

would indicate less knowledge than 60 per cent on the second test. For this reason it seemed advisable to look for some better basis for determining quality of performance.

Standards of Performance.—Standardized tests have been carefully prepared so that they have validity and reliability of a relatively high order. Also the scores are expressed in some form that is readily interpreted. When the per cent of perfection standard was abandoned, the usual tendency was to fall back on the performance of some supposedly normal group for a standard or norm. Intelligence was defined in terms of the performance of normal children. A mental age of eight years, for example, was, by definition, the level of intelligence that just fitted the average eight-year-old child. Similarly, the norms for a French test might be determined by giving the test to New York state students in June and finding their average score. In general, our present standardized scores are based on the actual performance of a group of children rather than on some hypothetical standards set up by the test makers.

However, it has been found that the performances of children in different parts of the country vary a great deal. Also the performances of children of the same age and grade may vary considerably even in the same city or county. For this reason the standardized scores of different standardized tests may not actually mean the same thing. Mental ages of 10 years, or IQ's of 110, may not be equal when obtained by using different tests.

When Terman standardized the original Stanford-Binet, he quite naturally tested the children who were most readily available. As a result, his standards were too high for the United States as a whole, and this was particularly true at the upper age levels. He concluded that the average mental age was sixteen years; but later and more extensive testing showed it to be considerably lower in terms of this test. In the same way, standardized scores on achievement tests and on personality tests will depend both on the nature of the test and on the sampling of the group on which the test has been standardized. Instead, then, of saying that a child has a particular mental age, as seven years, we shall be on safer ground if we specify the test on which the mental age was scored, for example,

a mental age of seven years on Form L of the revised Stanford-Binet scale.

Standardized test norms are usually expressed in terms of averages for ages or grades. Variation within these ages or grades may then be expressed in terms of centile ranks or of standard scores. A centile rank (also known as percentile rank) tells the percentage of the pupils of a given group who have made lower scores than the score in question. Hence a centile rank of 10 means that 10 per cent

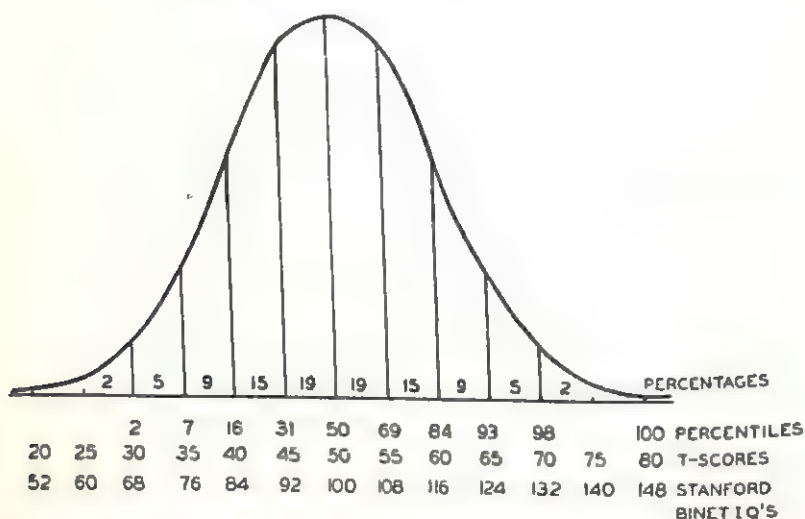


FIG. 30.—Normal curve divided into segments of 0.5 SD to show: (1) percentage of cases in each segment; (2) relation of percentile scores to the normal curve; (3) relation of T-Scores, often called standard scores, to the normal curve; and (4) the significance of IQ's when the mean is 100 and SD is 16, as in case of the revised Stanford-Binet scale.

of the group made a lower score and 90 per cent of the group made a higher score. Standardized scores (also known as T-scores) are based on an arbitrary average of 50 points and an arbitrary standard deviation (SD) of 10 points. For practical purposes, the SD is about one-fifth or one-sixth of the total range of scores when a large group is tested. Consequently standard scores range from about 20 or 25 at the lower end to 75 or 80 at the upper end of the scale. Figure 30, which is based on Figure 5 on page 34, shows the relation of centile ranks and standard scores to the normal distribution of Stanford-Binet IQ's.

Objectivity.—Standardized group tests are given according to definite standardized directions, usually with fixed time limits, and are scored with standardized scoring keys. This makes it possible for different trained examiners to obtain comparable results. Subjective factors in giving and in scoring the tests, which would make for differences in scores, have been very largely eliminated. On the whole, the group intelligence tests and the achievement tests are the most objective. The individual intelligence tests, such as the Stanford-Binet, are more likely to be influenced by the subjective judgment of the examiner. Personality tests, such as the Rorschach, are still more influenced by individual differences in the interpretation given by the examiners, and for this reason can hardly be considered to be fully standardized.

Simplicity and Convenience.—While it is not technically necessary for a standardized test to be simple and convenient to use, this is almost a practical necessity if the test is to be widely used and if the users are not to make many errors in giving and scoring the test. In most cases the test makers have succeeded in making the directions very simple for giving and scoring group intelligence tests and achievement tests, but considerable special training is required before an examiner can be trusted to give, score, and interpret the individual intelligence tests. This severely restricts their use.

INTELLIGENCE TESTS

Nature of Intelligence.—The function of the intelligence services of the Army and Navy is to obtain information. Similarly, in ordinary usage, we are likely to think of the intelligent man as the one who is well informed. Mental testers, however, are more likely to think of intelligence as the capacity for learning, for acquiring information, and for solving problems, rather than as something already achieved. On this basis, identical quadruplets might all be of equal intelligence, that is, of equal learning capacity; but might vary considerably in the amount of information they had acquired, especially with reference to particular subjects.

Although most psychologists accept the idea that learning capacity is an essential aspect of intelligence, they may differ considerably in the phases of intelligence that they emphasize. Thus Spearman stresses the idea that intelligence is concerned especially with the ability to see relationships, whereas Terman emphasizes the ability to deal with abstractions and generalizations.

Broadly considered, learning capacity will include both the capacity to grasp relationships and the capacity to understand and use abstractions and generalizations. At the lowest level, however, intelligence and learning capacity are limited to dealing with simple and concrete situations; the crayfish learns to turn to the left rather than to the right to get to his food; the hen learns to eat the food placed on the darker of two pieces of paper; and the spider learns to ignore noises that formerly would have caused him to stop working on his web. At the highest level of intelligence, artists design their masterpieces; philosophers work out abstract principles of logic and ethics; and research scientists formulate, interrelate, and apply complex scientific generalizations. All of these are based on learning from experience, though at the higher levels of intelligence we find that a knowledge of the past is used to forecast the future, or that items learned in one situation are analyzed and recombined into new designs and inventions. The ability to create requires a higher order of intelligence but is always based on learning from past experience.

Special Capacities versus General Intelligence.—Intelligence tests have usually been thought of as tests of general intelligence. But this has involved a great deal of controversy between different schools of thought. Spearman has been the chief supporter of the idea that intelligence is general in nature and that the same intelligence functions in all kinds of situations that involve the understanding of relationships. E. L. Thorndike has been the leader of the group which minimized the importance of any possible general factor and emphasized instead the importance of special capacities. According to this view, no two acts require the functioning of quite the same neurone combinations, and, for this reason, all capacities in the individual tend to be somewhat different.

English psychologists have been rather more favorably disposed toward Spearman's view, whereas American psychologists have tended to support the more specific interpretation of intelligence.

On a purely empirical basis, we find that the correlations between the measures of different performances are usually positive. Spearman's hypothesis is based on this fact. At the same time, we also find that, even though positive correlations are more frequently found between different capacities, there are also many cases of negative correlation in the sense that many individuals score *above* average in one capacity and *below* average in another capacity. It is these latter cases that are emphasized by those who stress the specificity of intelligence.

Between these more extreme views is the group factor hypothesis supported by many American psychologists. This view holds that there are a number of more or less elementary factors which enter into related groups of situations. Thus facility with numbers will enable one to do better work in statistics and accounting as well as in doing problems in physics, chemistry, and genetics. Facility in visualizing will help in biological laboratory work, in mechanical drawing, and in art.

It is also recognized that the intelligence tested by the conventional intelligence test is not really "general" in character but is limited rather to the intelligence most used in school. Binet made his original test specifically to predict success in doing school work, and later intelligence tests have tended to follow the same pattern. There are, however, situations that involve learning of types rather different from those usually presented in school. Here we may mention especially music, art, mechanics, and social affairs. Some children are very talented in music or in art but very slow in school. The same holds for mechanics and social adjustment. Consequently, since the correlations between these different kinds of ability are very low, we find individuals in school who are inferior in one kind of ability and average or superior in another. There will be children who have great difficulty with reading and with arithmetic but who will be better than other pupils in music, or in art, or in mechanics, or in making social adjustments. On the other hand,

there will be instances of pupils who do excellent work in regular school subjects but who have great difficulty in one or more of these special fields, such as mechanics, art, music, and social affairs. Also, there are even brilliant college professors who may show great deficiencies when called upon to deal with problems outside of their specialty. These differences make it desirable to analyze the abilities of an individual as far as circumstances and needs permit and require. Only in this way can we do the most effective work in the field of guidance.

Level, Area, and Speed.—Thorndike²³ analyzed intelligence into three aspects as noted: level, area, and speed. However, the usual test of intelligence is concerned primarily with determining the highest level of difficulty at which the individual is able to function, and separate scores are not given for either area or speed.

The second problem, that of area, is concerned with the extent of a person's capacities at a given level. Some individuals may be very intelligent in a very narrow area, while others may be highly intelligent in dealing with problems over a wide area. This is likely to be greatly influenced by the extent and range of interests and perhaps also by physical and mental energy. The person with wide interests and much energy is more likely to show intelligence over a wide area than is the person with limited interests and energy.

Studies of the relation between the level of intelligence and the speed with which these operations are carried out show that the correlation tends to be relatively low.^{2,3,6} It is probably not above .50 for group intelligence tests. This means that when the time limits of intelligence tests are so short that the majority of the students do not finish the test, some of the students who are slow will receive scores that do not show their superior ability. Some students who deserve a high rating for level will receive a low rating on a speed test. These are extreme cases and are not numerous, but they do occur. Less extreme cases are, of course, more frequently encountered.

This is one of the most serious defects of present group intelligence tests. We need separate scores for level and for speed. This difficulty has been solved in the case of the Cooperative Reading

Test by making an examination of 90 items in three equivalent parts, with 30 items in each part. Nearly all students finish the first section of 30 items and so may be given a level score based on the number of items in this group that are correct. Actually, however, each student receives a level score based on the number of items correct in the sections of the test that have been completed, that is, on either 30, 60, or 90 items. The speed score is based on the total number of items completed. If, for example, a student does 65 items, his level score is based on the number correct out of the first 60 items. A student who does only 35 items may receive a level score higher than that received by the first-named student, but his speed score is, of course, much lower. Something like this could be done for intelligence tests so that we could know both how fast a person works and the highest difficulty level at which he can work (cf. 8).

Growth and Decline of Intelligence.—The growth of intelligence has been discussed in Chapter 2, but it is desirable at this point to review and supplement some of the conclusions reached there.

Growth curves for different physical characteristics differ, but they also tend to show some common characteristics. Generally speaking, growth is much more rapid in early infancy than it is later. The rate of growth tends to decline with age. However, physical growth tends to show an increase in rate at the pubertal or early adolescent period followed by a decline in rate to maturity.

The curve of mental growth has been harder to determine with accuracy because of the lack of suitable measuring scales, and partly as a result of this there has been a disagreement as to the exact nature of the mental growth curve.^{11,23,25,26} Probably the majority of psychologists would support the idea that mental growth, like physical growth, is most rapid in early infancy and that the rate of growth slows down as maturity approaches. There is, however, no very clear evidence of a pubertal acceleration in mental growth.

When Terman published the original Stanford-Binet Test in 1916 he concluded that mental growth stopped at the chronological age of 16 years; and the calculation of IQ's was based on this

assumption. When the intelligence test results obtained from the Army in World War I showed that the average soldier had a mental age of only a little over 13 years in terms of the Stanford-Binet, some psychologists erroneously concluded that mental growth stopped in the average citizen at the chronological age of 13 or 14. Later studies, however, have shown that scores on mental tests continue to increase with age up to about 20 years, depending on the particular test used. From this we may conclude that mental growth continues as long as physical growth.

There is little change in average mental test scores with age from 20 to 40 years, though the scores do begin to decline as soon as the peak level is passed in the early twenties. After 40 years, the rate of decline increases with age. Mental speed seems to be affected more than level, although level is also affected. Rote memory is more affected than rational memory. Older people have the greatest difficulty in learning things that involve the unlearning of previously acquired habits and associations. They may, however, retain a high degree of efficiency in doing things with which they are familiar.

Mental Age and IQ.—The Binet Test and its revisions were standardized in terms of mental ages. The tests that could be passed by the average child of six years, but which could not be passed by the average child of five years, were called six-year tests. In using the test, when a child is tested and his performance agrees with that of the average child of six, he is given a mental age of six years.

This method works very well at the lower ages but encounters difficulties at higher ages. We have noted that older people make lower scores on tests than are made by those about 20 years old. Hence, according to the foregoing definition, a mental age of 60 years would be considerably lower than a mental age of 20 years. Above the age of ten or twelve years, mental ages are somewhat arbitrary, and the mental age scales have been developed with the idea of measuring the mental functions used in high school work rather than with the idea of developing accurate standards for measuring the development of the average individual. This practice may,

however, be justified on the grounds that the tests were developed for the purpose of predicting school performance.

Related to this question is the problem of the mental age of the average adult. Terman concluded that this was 16 years, but, as stated before, Army results showed that 16 years was too high. On the 1937 Stanford revision, Terman uses a mental age of 15 years for the average adult, but he points out that his sample of the population is above the average. Consequently, 15 years is quite possibly too high in terms of the Stanford-Binet scale. It should be understood, however, that this or any similar standard is somewhat arbitrary. It does not mean that the average adult has the mental capacity of the average fifteen-year-old adolescent. It means only that the average adult is supposed to have the mental capacity of a Stanford-Binet, 1937 revision, mental age of 15 years. Another psychologist could, if he desired to take the trouble, make a scale on which the average adult would receive a score of 20 years. The unit of "mental age" is not a fixed objective unit such as the inch or the pound; it varies from test to test and from age to age in the same test.

Stern suggested the desirability of relating the mental age to the chronological age in order to get an indication of the brightness of the child. Obviously when two children both have the mental age of six years, but one is four years old and the other is eight years old, the former one is the brighter. To meet this need, Terman developed the IQ. Essentially the IQ is the mental age divided by the chronological age to two decimal places. Thus if a child of 4 years has a mental age of 5 years, his IQ is $5/4$, or 1.25. However, in order to eliminate the decimal, this quotient is now multiplied by 100, which gives 125. Hence the IQ of children may be defined as 100 times the mental age divided by the chronological age.

In adolescents and in adults, the formula for the IQ must be modified. The average child is supposed to receive the same mental age as his chronological age, which gives him an IQ of 100, but, as we have seen, mental ages for adolescents and adults are somewhat arbitrary. If the average adult receives a mental age of 15 years on the revised Stanford-Binet, we must use a chronological age of 15 years when we calculate his IQ in order to get an IQ of 100. Fur-

thermore, on this test we must never use a higher chronological age than 15 years, because if we did so this would cause the IQ to decline.

These and other difficulties in the comparison and interpretation of mental ages and IQ's will indicate the need for familiarity with the tests on which such results have been obtained if we are to be in position to evaluate very accurately the ratings of different individuals on the same test and the ratings of the same individual on different tests.

Types of Tests.—One classification of intelligence tests is into individual tests and group tests. The Binet Tests are examples of widely used individual tests. In order to give these, the examiner must have considerable training and he must test each child individually. The time required varies according to the individual case but tends to increase with age, the normal range being from about twenty minutes to two hours.

Group tests, in contrast, are given according to simple, well-standardized directions and may be given by the average teacher with little special preparation. The group may include several hundred students or might even be larger if a satisfactory loud-speaker system is available. If, however, there are more than fifty individuals tested, there should be proctors for each fifty students.

There is also an important difference in the scoring of group tests and individual tests, in that the former can be scored by almost any careful worker with relatively little training, whereas the latter require much more training and experience.

Intelligence tests may also be classified as verbal tests or as performance tests. Most tests are of the verbal variety: the directions are given in a language and the responses are usually in words. These tests may be further divided into the oral and the written. Binet tests are chiefly verbal oral tests while most group tests are verbal written tests. Performance tests are given to minimize the use of language, and are used on the deaf, on the illiterate, and on literate foreigners who do not understand the language of the test. The directions for performance tests are given by signs or by panto-

mime, and the responses are given by doing something rather than by talking.

Army Beta is a group performance test which was developed to test soldiers who did not read and write English well enough to take Army Alpha. There are also individual performance tests which may be used in testing special cases.

Some of our modern tests, such as The California Test of Mental Maturity, which is a group test, and the Wechsler-Bellevue Test, which is an individual test with separate forms for adults and for children, include both verbal and non-verbal materials and may permit the determination of both verbal and non-verbal IQ's as well as a total IQ.

These non-verbal tests are of value when the individuals tested have a language deficiency, but the non-verbal IQ's do not correlate very well either with verbal test results or with school performance, and for that reason are usually less desirable than verbal tests. However, in special cases, they give information that is a valuable substitute for, or supplement to, the scores on verbal tests.

Tests of Special Abilities.—The ordinary intelligence test does not measure mechanical ability, musical ability, artistic ability, or social ability. Consequently, special tests have been developed to measure these abilities, and these tests can be used in cases where it is desirable to predict success in specialized lines of study or activity. For example, the Seashore Music Test has been used at the Eastman School of Music to pick out those individuals who are likely to have special difficulties in the study of music. Also, it is now common practice in industry to use tests of mechanical ability to assist in the selection of workers for jobs requiring mechanical skill.

Tests of special abilities, and of personality characteristics as well, were extensively used in our armed forces during World War II. These made it possible to reduce greatly the errors in the selection of men for particular jobs, and this meant a great saving in both time and money as well as a saving of many lives in services such as the Air Force.

Prognosis Tests.—It has been found that the correlation between abilities in mathematics and language is rather low; some students are good in one and poor in the other. For this reason, a general intelligence test may not predict satisfactorily the students' special capacities along these lines. Consequently, tests of mathematical capacity and of language capacity have been developed and are used to give more accurate measures of these specialized functions. These tests are sometimes called *prognosis* tests.

However, the capacities required for work in arithmetic, in algebra, and in geometry are not altogether the same, so that different tests may be used to give independent predictions of probable performance in the different branches of mathematics. Some students who have very little difficulty with algebra have difficulty with geometry, possibly because they are poor in visualizing geometrical figures. Also some students may find algebra much harder than geometry partly at least because geometry is somewhat more concrete while algebra is very abstract.^{13,14}

In the same way, reading readiness tests have been developed for use in the first grade to give a better prediction of probable success in learning to read than can be obtained by the use of intelligence tests alone.

Ordinarily these prognosis tests should be used in connection with school marks, achievement tests in related subjects, and general intelligence tests in order to get the best prediction of work along specialized lines.

ACHIEVEMENT TESTS

Most of the tests used to test achievement are made by the teacher. But teachers vary greatly in skill in the construction of tests, and teacher-made tests are frequently of low reliability. For this and other reasons, standardized achievement tests have been developed for most of the subjects taught in the elementary schools, in the high schools, and in the first two years of college. These are more carefully prepared than most tests made by classroom teachers, and the reliability is usually high. They are of value particu-

larly when it is desired to compare student or school performances with national norms.

The validity of standard tests is uncertain for reasons similar to those mentioned in case of intelligence tests. Educators do not agree as to the proper objectives to be aimed at in teaching various subjects. Subjects and courses that bear the same titles may vary considerably in different schools and even in the same schools when taught by different teachers. In schools where the ideals of the Progressive Education movement prevail, great variation may be found in classes taught by the same teacher in different years. This means that there is no standardized curriculum, and when there is no standardized curriculum, there can be no valid standardized test to measure achievement in this curriculum. Hence it is not surprising that the Progressives have tended to show less interest in the development and use of standardized tests.

Even when courses are fairly well standardized, there will be enough variation in the textbooks and other materials used, and in the emphasis on different topics, to give grounds for scrutinizing carefully the content of such standardized tests as may be used.

If teachers know that certain tests are to be used and that the achievement of the class, and hence the rating of the teacher, is to be based on the results of the test, the natural tendency is to teach with this objective in mind. This will tend to increase the validity of the test, but many educators will object to this type of teaching. In general there is danger that such teaching will tend to emphasize unduly the memorizing of factual materials rather than the development of a fundamental understanding of the topics and their broader significance.

Measurement and Evaluation.—At the present time, educators talk a great deal about evaluation. This is a much more complex and difficult process than measurement. Evaluation implies in the first place some system of values to be attained by education.¹⁹ In the second place it involves arriving at a judgment of the degree of success in attaining the given set of values which are accepted by the educator who is making the evaluation. This involves taking into account all of the factors related to the situation, but many of

these factors may be intangible and not subject to accurate measurement. To this extent, evaluation is not a scientific process and is not properly within the scope of a scientific educational psychology.

A student may take a course and may be able to pass an achievement test with a high score. But the student may have developed a dislike for the teacher and for the subject and may also have developed undesirable personality characteristics as a result of experiences in the course. This experience may involve a change in attitude toward the profession the student had planned to enter and it may cause complications in the student's relation to his family and friends. It is within the scope of educational psychology to attempt as far as possible to measure these various factors, to determine the relationships between them, and to determine their psychological effects, but the final judgment of evaluation is beyond the pale of science. What one thinks of the total value of the experiences in a course will depend not only on what is actually accomplished by the course but also on his own character and standards of value.

In this sense every educator will wish to evaluate the total effects of all teaching. In doing this he will naturally use all of the pertinent data available, and this will frequently include the results secured with standardized tests, but the evaluation itself cannot be judged by strictly scientific standards. For this reason we make no attempt at a systematic consideration of evaluation in this text. Rather we must restrict ourselves to a consideration of the determination of the data on which evaluation is largely based.

The term "appraisal" is also frequently used in connection with the process of arriving at judgments as to the results obtained by educational activities.²⁰ Thus we may speak of appraising the success of a given project or of a course. This is a broader term than the word measurement and implies the use of data other than those obtained by the use of ordinary measurements. In this sense, the term is a useful one in our educational vocabulary. However, when different people base judgments on intangible considerations or on less reliably determined facts, their appraisals are likely to vary accordingly.

Types of Achievement Tests.—Achievement tests may be given either for the purpose of determining the achievement of pupils as a group or as a basis for analyzing the work of individual pupils. Two different kinds of achievement tests have been developed to meet these different needs. Survey tests will cover an entire field of work, as arithmetic or spelling, and will give a good index of the achievement of an entire class. Such results will tell a school superintendent how his school system compares with other systems in total achievement. They will tell him something about differences in the success of his teachers. And they will indicate to the teacher those operations in which a class as a whole is relatively superior and those in which it is relatively inferior. For example, a seventh grade class in arithmetic may be up to grade in fundamental operations with whole numbers, but they may be very weak in operations with common fractions. This will indicate the need for devoting special attention to fractions before attempting to present new material.

However, the most effective teaching requires the teacher to locate the strong and weak points of each pupil. For this purpose special diagnostic tests are available. These are more detailed and make it possible to determine more accurately the specific abilities in different kinds of operations. When this has been done, the teacher is ready to do corrective teaching, which is one of her most important functions.

In spelling, there are certain words that are more difficult than others. Jones, for example, compiled a list of the 100 most difficult words in common use. If this list is given to a class, there will be wide variation in the total scores of different pupils, but pupils who make the same score will differ in the words that they miss. Effective teaching naturally will require that these errors be located for each pupil and that he should concentrate on correcting them.

The problem of diagnosis will be considered somewhat more fully in later chapters. However, for anything like a comprehensive treatment of the problem, the student will find it necessary to consult some of the monographs and manuals on special subjects such as reading and arithmetic. The diagnostic tests help to locate the

nature of individual difficulties, but a real diagnosis of some of these cases will require in addition a consideration of biological and medical factors and of the child's adjustment to his social environment, for the reason that success in school may be greatly affected by conditions outside of the school itself.

Intelligence and Achievement.—In Chapter 2 it was pointed out that the correlation between intelligence and achievement is far from perfect. At the college level, for example, the correlation between the total score on a group intelligence test and average grades is usually not far from .50. At lower grade levels, it is usually somewhat higher, though rarely higher than .75.

The fact that this correlation is less than 1.00 means that, *on the average*, children who make high scores on intelligence tests make somewhat lower scores on achievement tests; and children who make low scores on intelligence tests make somewhat higher scores on achievement tests. This is an example of what is known as statistical regression: those who deviate from the average in one trait will tend to deviate less in the correlated trait, though there may be wide variation in individual cases.

This failure of school achievement to correlate perfectly with intelligence has disturbed some educators, but it should not be surprising when we analyze the various factors involved. School performance depends on many factors that are relatively independent of intelligence as it is usually defined. Interest in school subjects is an important factor, desire to secure high grades, desire to win social recognition, fear of parental censure, practical need for learning certain things, available time, health, and various other factors, will influence the grades a student receives in school. Hence it is not to be expected that a perfect test of intelligence—if we had such a test—would correlate perfectly with grades. Also it is quite conceivable that higher intelligence is especially concerned with ability to solve original problems, to invent, and, in general, to do creative work. Yet success in school work may depend more on memory which is largely rote in character. If this is true, a test that stressed memory rather than creative imagination and reasoning would give a better correlation with school work. In any case, because of these

and other complications, it is not to be expected that any intelligence test will be devised that will correlate perfectly with school achievement.

PERSONALITY TESTS

Personality tests may be classified roughly into three groups; tests of ordinary personality traits; tests of interests and of values; and tests of adjustment. However, our psychology of personality is not as yet very far advanced, and, partly as a result, our personality tests are still largely in the experimental stage.

In current analyses of personality traits, the chief emphasis is placed on such characteristics as introversion-extroversion, dominance-submission, sociability, self-sufficiency and neurotic tendency. These concepts are, however, not well worked out, and, as a result, different standardized tests of introversion-extroversion, for example, do not correlate very well. In part this is probably because these terms do not mean the same things to different psychologists, and in part because the tests themselves are unreliable.

Attempts to measure personality have been made usually by one of three methods: questionnaires, rating scales, and projective techniques. All of these methods encounter the difficulty that there is at present no really satisfactory method of validating any kind of personality test. There is no accepted criterion with which personality test results may be correlated. It should then not be surprising that different personality tests which are supposed to measure the same trait, for example, emotional maturity, may show very low correlations with each other.

Questionnaire tests have been very commonly used. Examples are the Bernreuter, the Bell Adjustment Inventory, the Guilford STDCR Inventory, the Humm-Wadsworth, and the Minnesota Multiphasic schedule. Under favorable conditions, some of these inventories are of value for the selection of employees in industry or for use by properly trained psychologists in counseling and in clinical work, but they have not yet been developed to the point that their use by teachers without special training can be recommended (Cf. 7).

Rating scales are widely used in educational circles. Teachers are asked to rate pupils in a variety of ways, and the teachers are themselves rated for efficiency by the administrative officers. Students applying for admission to college or to graduate school or for positions in the business world will also very frequently find that their selection will depend in part on the ratings they secure from teachers or others.

Such ratings are probably a necessary part of our system, but numerous studies have shown that ratings of personality traits are both of questionable validity and of low reliability. When different traits are rated, the ratings are likely to show a halo effect and to be more uniformly poor, mediocre, or good than is justified by the traits of the individual rated. The personalities of the raters seem to influence the ratings, with the result that when an individual is rated for a given trait by a dozen or more raters, the ratings will frequently vary from poor to good. For this reason it is advisable as a rule not to attach undue weight to ratings made by one rater.

Projective techniques for measuring personality have been developing rapidly in recent years. These include especially the Thematic Apperception Test (TAT) and the Rorschach method based on the individual's reactions to a standardized set of ink blots. Many clinicians consider these tests to be of great value, but they are limited in usefulness both because extensive training and experience are necessary in order to interpret the results of the tests, and because they require a great deal of time for administration and scoring. For these reasons such tests must be reserved for the special study of individual cases by qualified clinical psychologists.

The Measurement of Interests.—Individual differences in interests are of great practical importance in educational counseling and guidance and more use, accordingly, is likely to be made of tests of interests than of other personality tests.

The more widely used inventories of interests are of the questionnaire type and are subject to some of the same criticisms that have been directed against other personality inventories. However,

students are probably more able to give accurate answers to the specific questions asked about their interests than they are to answer questions that relate to their neurotic tendencies and other personality characteristics. Furthermore, there is probably less disposition to tend to make the answers to an interest inventory conform to what is believed to meet with social approval. In spite of the criticisms directed against these inventories, therefore, they are recommended for use in high schools and colleges. They will be discussed in Chapter 16 in connection with the problem of guidance, and consequently will not be considered further here.

THE SCHOOL TESTING PROGRAM

If a school is to have a satisfactory testing program, it will be necessary to have some qualified person in charge of this program, and this will generally mean that this person will do either less teaching or no teaching at all. In large cities an adequate testing program will require the full time services of several people.^{4,9,22}

Intelligence tests should be given at the kindergarten or first grade level and repeated at intervals of two or three years. These will usually be group tests, and they should be supplemented by individual tests of children who require special attention.

Reading readiness tests are helpful as a basis of classification into reading groups in the first grade.

Achievement testing may begin with reading tests, spelling tests, arithmetic tests, and writing scales in the early grades. In later grades some of the general achievement tests may be used. At the high school and college levels there are good tests available both for special subjects and for a survey of general achievement. Also at this level, an interest inventory will be a desirable addition to the testing program.

If the test results are to be of great value some kind of cumulative record is necessary, and the results must be readily available to teachers, particularly to those who are responsible for educational and vocational guidance.²⁷ This aspect of the problem will be discussed further in Chapter 16 on Counseling and Guidance.

QUESTIONS AND EXERCISES

1. What are the most important characteristics of a standardized test?
2. How is test validity determined? Why may this be difficult?
3. How is test reliability determined? What are some of the factors which influence reliability?
4. A test may have high reliability and low validity, but it cannot have high validity and low reliability. Explain.
5. How reliable are tests of intelligence? How may the reliability of an IQ be increased?
6. What are the implications of the statement that the mental growth curve is negatively accelerated?
7. What is meant by a mental age of 6 years?
8. Why is the statement that a child has an IQ of 110 somewhat indefinite in meaning? How could the statement be made more accurate?
9. What kinds of capacity are measured by conventional intelligence tests? What capacities are usually not measured by them?
10. How are speed and level of ability correlated? How may this be important in education?
11. Why may the validity of a standardized achievement test vary from school to school and from class to class?
12. To what extent does the term "evaluate" involve non-scientific factors?
13. How may standardized tests be used to improve teaching in arithmetic? In spelling? In reading?
14. What is the present status of personality tests? What are their proper uses in schools?
15. What should be done about keeping records of test results? How may they be made most useful?

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CHAPTER 12

CLASSROOM TESTS AND MARKS

Standardized tests are of great value for certain purposes, but they cannot well be used for most of the testing and appraising that needs to be done in connection with day-to-day teaching. This is true for a number of reasons. If a standardized test is to have high validity for measuring the achievement of a particular group, the test must be closely adapted to the instructional program that has been followed. This means that standardized tests will tend to be generally valid only in proportion as courses themselves are standardized. However, since courses in different schools tend to show considerable variation, the validity of any given standardized test will vary accordingly: in some cases the test may have high validity and in other cases low validity. For this reason tests made by the classroom teacher are generally necessary in order to cover areas that otherwise will not be adequately covered.

A second limitation to the use of standardized tests arises from the fact that they are not ordinarily adapted to the measurement of smaller units of learning, and since most of the testing that is done in many classes has to do with these smaller units, it will be necessary for the teacher to construct suitable tests.

Some teachers will also raise the objection that standardized tests are objective in form and that they are inferior to essay examinations as measures of the student's ability to recall material and to organize it. Consequently, even if standardized tests were available, these teachers would refuse to use them in many cases.

In view of these and other considerations, it seems evident that standardized tests cannot now be used for much of the testing that needs to be done. This would seem to indicate that most teachers will need to be proficient in the construction and use of classroom tests.

The Functions of Classroom Tests.—Tests and examinations have, at times, been limited largely to those given at the end of a course for the purpose of measuring achievement, and, more specifically, for determining what students had passed and what students had failed. From this point of view, examinations would tend to have a somewhat limited value. However, in contrast to this view, modern educational theory emphasizes the importance of tests and examinations as a vital part of teaching procedures and holds that the most effective teaching is ordinarily not possible without them.

In some cases, tests are needed as a preliminary to instruction. If, for example, a suitable arithmetic test is given to an ordinary class at about the sixth grade level, it will not infrequently be found that the abilities of the class vary greatly in different parts of the subject. Also the proficiency of individuals will ordinarily vary more with reference to specific skills.

Because of this fact, the most effective instruction is impossible until after the teacher has made a rather accurate determination of the actual status of the class. When such a preliminary test shows that the class is relatively weak in subtraction and relatively strong in addition, it appears obvious that special attention will need to be given to subtraction. In a similar manner individual weaknesses can be located and corrected.

Fortunately, good standardized tests are available for this type of testing in the fundamental subjects in the elementary school, but in many other cases it will be necessary for the teacher to construct tests that are adapted to the specific teaching situation.

A second function of tests is found in the fact that they have a very important influence on the methods of study used by students. If a teacher announces that an essay test or a true-false test will be given over a given assignment, the class will tend to make the kind of preparation best suited for the particular test. In general it may be said that the tests will be more valid and reliable if the teacher does announce in advance the nature of the test; for obviously a class cannot prepare most effectively for a test if they do not know what to expect.

In the third place, tests provide an opportunity for student ex-

pression. Reaction is an important part of the complete learning process. Without tests, learning would tend to be too much a process of absorption. If we are to use knowledge, we must usually be able to recall it. By giving tests we may encourage students to practice recall. Frequently a student thinks he knows a topic, but when he tries to recall it he realizes that his knowledge is inadequate. Knowledge is not satisfactory until expression in proper form is possible.

In the fourth place, tests given after teaching and during the course of the term are a most important basis for the location of errors resulting from learning. No teacher and no student is perfect. For this reason, it becomes important to locate the errors that still persist and make an attempt to correct them. Tests should be analyzed for this purpose, and this analysis should be followed by corrective teaching. In making this recommendation, we are following the outline recommended by Morrison in his teaching formula: test, teach, retest, adapt procedure to correct errors, and so on, until mastery is attained. In one case a teacher attempting to follow this formula spent half of a class period trying to correct an error made by a number of members of a class. On a retest, it appeared that at that time nearly all of the class had gained a wrong conception of the topic! The attempt at correcting the error had made matters worse. Obviously, then, there was a need for further instruction and testing until the error was corrected. This is, therefore, a process that needs to be continued until the desired results are obtained.

A fifth function of tests is found in the fact that they furnish a basis for marks and reports of progress. Since marks are almost universal in high schools and colleges, this is a most important function of tests and examinations. And since the validity and reliability of marks are determined largely by the character, number, and length of the tests given, it is desirable that tests be given frequently if important decisions, such as college admission, are to be made on the basis of marks.

When marks are not given, tests will afford a better basis for analyses of the performance of individual pupils and for such reports as may be made to the parents.

A sixth important function of tests is to supply an additional motive for studying. Some teachers object to this use of tests, but a realistic appraisal of the study habits of students will show that they do study more when tests are given frequently, and this conclusion is supported by experimental evidence. Achievement scores on a final examination will be higher when frequent tests have been given during a semester than when tests have been omitted.

It has also been shown that students make better progress in learning when they have a knowledge of the progress they are making. It is not, therefore, sufficient simply to give tests: they must be corrected and the results given to the students; and the sooner this is done, the better the results will be. Later in this chapter, a simple method will be explained by which students may correct their own papers during the class period in which the test is given. This procedure makes it possible to correct errors at once and to supply a more effective motivation than when the papers are returned at a later date.

Final examinations have special values over and above the values of tests given during the term. Studies of learning have shown rather consistently that material generally tends to be forgotten unless it is reviewed and that for best results these reviews need to be continued over a considerable period of time. It is, then, not enough that tests be given regularly: systematic reviews are needed at later times; and final examinations normally encourage such reviews.

Contemporary educational psychology also emphasizes the importance of seeing a subject as a whole as a means of better understanding and better retention. The review for final examinations tends, obviously, to encourage students to get this comprehensive view of larger units of material and to see relationships that may not have been appreciated earlier in the necessarily piecemeal study of smaller units of work.

A further argument for final examinations may be based on the fact that there are marked individual differences in rates of forgetting with the result that students who have made the same mark on

a test given early in a semester are likely to show quite different degrees of mastery of the material several months later. If, then, the marks on a course are to represent with reasonable accuracy individual differences in mastery of the course content, some later measurement of performance, such as a final examination provides, would seem to be desirable.

For these reasons the preparation for final examinations should be a most important part of a student's learning experience. If no final examinations were given, learning would tend to be both less thorough and less meaningful.

In Chapter 7, in connection with the discussion of memory, the question was raised as to whether students should be exempted from final examinations on the basis of high test marks during a semester. It was pointed out that even the best students tend to forget, and that, consequently, they will profit from a general review in preparation for a final examination.

This conclusion may now be reinforced by noting that some of the arguments for final examinations mentioned above apply especially to superior students. Obviously they should be most able to integrate the material of a course as a whole, and it would seem, therefore, that they should profit most from the process.

Superior high school students are most likely to continue their education in college or university, and for this reason as well, they are likely to have a greater need of a thorough knowledge of the fundamentals of a course. Success in college mathematics, for example, usually depends on how well a student has mastered the mathematics he studied in high school.

Final examinations are more generally required of all students in colleges and universities, and, consequently, superior high school students should have practice in preparing for and in taking such tests so that they will be better prepared for college work.

On the whole, therefore, it would seem that final comprehensive reviews and examinations should be regarded as an important part of a student's educational experience, and that no student should be exempted.

PROBLEMS OF TEST CONSTRUCTION

Validity.—In Chapter 11 the general problem of test validity and reliability has already been discussed. However, it seems desirable to consider these topics further and more specifically in relation to classroom tests and marks.

A test is valid in so far as it measures progress toward the objectives of a course. Both the form and the content of a test, therefore, should be determined with due regard to these objectives. In some cases, practical examinations are necessary; in others, essay examinations are preferable; while in others, objective tests may be more satisfactory. Similarly, the content of a test may vary from objective questions based on the recognition of rote memory items to essay questions which require the application of principles in the solution of difficult and complex problems.

If teachers will follow the practice of submitting their tests to other teachers for criticism, more valid tests should result. Also, at times, critical comments may be invited from students.

After tests have been given and scored, the individual questions and items in the test may be partially validated by considering the results obtained. Have the results been in line with expectations? And have the better students in the class generally made better scores than the poorer students? If affirmative answers cannot be given to both of these questions, either the test needs to be revised or the teaching needs to be improved.

Reliability.—The reliability of a test is determined by the extent to which it gives the same results at different times, or perhaps by the degree of agreement between scores on the two halves of the test. If a test is very unreliable it may result in a high score for a student at one time and a low score at another time.

Reliability depends on the careful selection of the test material and also particularly on the length of the test. Other things being equal, the longer the test, the greater the reliability. In general, errors of measurement vary inversely as the square root of the number of items in the test. Hence for a test of 100 items the error tends to be one-half as large as for a test of 25 items. This means that if marks

are to have a high degree of reliability they must be based either on many short tests or on several long ones.

The reliability of test results is also influenced by variations in the performance of individuals. Studies of individual variation have shown that, if one person repeats a given performance many times, his different scores may be plotted to give something similar to a normal distribution curve. Also, students vary in variability: some students are relatively consistent while others are more variable. This is an additional reason for giving a number of tests rather than a single final examination.

Unfortunately test reliability is often influenced by variations in the performance of teachers as well as students. Teachers have been shown to vary greatly in the marking of essay examinations, and, even in the marking of objective tests, serious errors may occur. This topic will be discussed further in connection with the problem of marks.

Objectivity.—Standardized tests are usually objective in that they are to be given according to definite directions and are to be scored according to prepared scoring keys so that great intelligence and skill are not supposed to be required in order to get accurate scores. This principle also applies in large measure to objective tests made by the teacher. Objective tests also have other advantages. They make it possible to compare the performances of classes in different years more accurately than when essay examinations are used, and, in case of large classes, they make it possible to save a great deal of the teacher's time. However, in spite of these advantages of objective tests, there is now more of a disposition to recognize the advantages of essay tests and to use them for certain purposes.

Gradation in Difficulty.—It is usually desirable that test items be graded in difficulty so that there will be some items easy enough for the poorest students and some that are too hard for the best students. When this is true there will be no perfect scores and no zero scores. Also, it is commonly desirable that the difficulty of the test be so adjusted that the average score on the test will be about 50 per cent of a perfect score. However, validity is always more

important than gradation in difficulty so that items should not be included simply to make a graded test.

It is theoretically desirable that tests be constructed to give a scale of equal units so that a difference between a score of five and a score of ten represents the same difference in ability as a five point difference in score at any other point on the scale, but this cannot be done accurately in case of ordinary classroom tests. Usually we come reasonably close to this goal if we give the same credit for each item in a test rather than by attempting to weight the different parts of the test differently. Careful studies have shown that the weighting of test items is usually not worth the trouble.^{7,13}

Mental Processes and Abilities Tested.—Ordinary objective tests may cover items learned and remembered by either rote or rational memory; they may require conclusions based on the application of facts and principles given; or they may require applications of facts and principles. Memory tests may require either simple recognition or recall.

It is generally supposed that essay examinations are more likely than objective tests to require organization and the expression of relationships whereas objective tests are more likely to emphasize a knowledge of facts. This may be and often is to some degree true, but it is not necessarily true. Objective tests may test ability to reason, and essay examinations may test rote memory.

Since different tests may test different functions and abilities, and since the correlations between different abilities in individuals are often not very high, it is evident that the relative scores made by different students on a test may depend greatly on the nature of the test given as well as on differences in the mastery of the material. Some students will do proportionately much better on some types of tests than on others, and, in view of these facts, it would seem in most instances to be desirable to give a variety of tests in order to supply an adequate basis for a fair appraisal of differences in average performance in a subject. At times this will mean that different types of essay tests and different types of objective tests will be needed as parts of an adequate testing program.

TYPES OF TESTS AND EXAMINATIONS

For present purposes, tests may be divided into oral, written, and practical or performance tests; although in actual use, these tests may overlap, as when oral questions are given in connection with the practical demonstration of a piece of apparatus.

Oral tests and quizzes have been in use for ages: the Socratic method was based on a system of oral questioning. Oral tests are still used for everything from ordinary daily recitations to final examinations for higher degrees. Individual intelligence tests are primarily oral tests and are considered valuable because they make it possible for a trained examiner to analyze more accurately the reactions of an individual to the test situation. In somewhat the same way, oral tests may make it possible for a teacher to get a better understanding of a pupil's grasp of a topic than if an essay or an objective examination were given. However, unless oral tests are carefully planned, and unless accurate written records of the responses are kept, as is customary in case of individual intelligence tests, the results of such examinations tend to be unreliable. Also, in case of important oral examinations, the social aggressiveness and "stage presence" of candidates often play a very important part in determining the outcome.

Practical examinations are often used in laboratory work and in other situations where practical performance is to be tested. A candidate for a scholarship in music is, for example, very likely to be asked to play a selection on the piano. Candidates for licenses to drive an automobile are usually given practical tests in driving as well as tests on laws and regulations.

In some of these cases, practical tests are probably more important and more valid than any other kind of test, but, since they are often individual tests, they may also require a great deal of time. In case of laboratory work, one of the chief difficulties is to include enough tests to make the result reliable.

Written examinations may be divided into essay tests and objective tests. These will require more detailed consideration.

ESSAY TESTS AND EXAMINATIONS

Essay tests are valuable in that they give students training in organizing and expressing their ideas; they offer opportunity for originality to appear; they tend to emphasize recall rather than simple recognition; and it is usually simpler to use them rather than objective tests to test reasoning.

On the adverse side, essay examinations do not ordinarily cover as much ground as can be covered by objective tests in the same time; they require a great deal of time on the part of the teacher to correct them; and unless teachers are specially trained in correcting such examinations, the marks based on them tend to be unreliable. For these reasons essay examinations are much less used than a generation ago, though there are still excellent reasons for using them when the teacher can take the time to read them.

Essay examinations may vary greatly according to the nature of the questions asked and the answers expected. In mathematics and the physical sciences, much use is made of problems. In social sciences, discussion questions are more typical. In some cases final examinations have consisted simply of a request for an organized summary of the most important facts, principles, and applications arrived at in the course.

One useful form of essay examination consists of a considerable number of questions which require only very short answers—possibly only one word. These have the advantage that the scoring is quick and reliable, and they usually require recall rather than simple recognition.

Another good essay test, which may be called either a “definition” test or an “identification” test, consists of a large number of items on which the students write answers of only a few lines each. In elementary psychology, items similar to the following might be included:

- | | |
|-------------------------|---------------------------------|
| 1. conditioned response | 7. mnemonic systems |
| 2. hypothalamus | 8. IQ |
| 3. rote memory | 9. curve of forgetting |
| 4. cochlea | 10. Broca's area |
| 5. plateau | 11. complementary colors |
| 6. cortical motor area | 12. elementary taste sensations |

With a little practice, these items can be scored on a point basis, allowing perhaps 5 points per item, so that the reliability compares very favorably with good objective tests.

Another type of essay test, originated by the writer, is called a "free-recall" test. In this the student is asked to put down in the form of complete statements anything he can recall about the topic under consideration. Each statement is to be numbered and is to be independent of other statements. Discussion of a topic is not permitted.

These tests are difficult to score accurately on a graded scale, but, like the projective personality tests, they provide an excellent basis for the appraisal of a student's grasp of a subject. Those who are not prepared for a test cannot hope to accomplish anything by guessing—except perhaps to introduce a little humor into the teacher's task of reading the papers. Moreover, since no questions are asked, ability to recall the important points will depend largely on the understanding of the material and on the extent to which it has been organized into a meaningful whole.

Perhaps one of the most important virtues of this test lies in the fact that it tends to encourage good study habits. In order to do well on the test, it is necessary for the student to pick out the more important items and to be able to recall them.

In scoring essay examinations, greater accuracy may be obtained if one question is scored on all papers before going to the next question, rather than by scoring a paper completely and then scoring the next one. Furthermore, greater accuracy usually results if the teacher does not know who wrote the paper. When the writer is known, a halo effect tends to make an individual's grades more uniform but not more accurate. For this reason better results are likely when papers are identified by number or when the names are written at the ends of the papers instead of at the beginning.

It is frequently recommended that teachers prepare outlines of the answers expected before beginning to score a set of papers. This will increase the reliability of the scoring when the questions are rather definite in character, but, in case of very general essay questions, the answers are likely to vary widely, and a greater degree of subjective judgment may be required. It also appears probable

that different teachers are likely to vary more in the marks assigned to the same papers when the questions are general than when they are specific. For this reason, if the reliability of the measurements is a primary consideration, more specific questions are to be preferred.

OBJECTIVE TESTS

Objective tests have come into common use largely because they save a great deal of time, and, when properly used, they have a high degree of reliability. However, when not properly constructed and converted into marks they may be even more unfair and unreliable than the old essay examination. Mental measurement is at best a difficult task, and a novice will not be able to guarantee valid and reliable results simply by using objective tests instead of the essay variety. We shall now consider briefly a few of the leading forms of objective tests.

True-False Tests.—A true-false test consists of a series of statements which are to be marked as either right or wrong. It is one of the easiest to make and probably largely for that reason it has been very widely used; but it can be very unreliable; and some students are unable to score anything like as well on it as they score on most other tests.

Language is at best open to misinterpretation, and for this reason true-false test items should be definitely right or definitely wrong. Trick statements and statements that require hair-splitting discriminations are generally to be avoided.

Statements that are partly right and partly wrong present a special problem. Some writers advise that these not be used at all. However, if they are used, probably the best procedure is to announce to the class that in case any part of a statement is false the item will be scored as false.

When test items are based on controversial material, as in the social sciences, a class should be informed as to the basis on which items are to be scored. This can be done conveniently by referring statements to a text, or to class lectures, or to particular writers, as "Shaw holds that, etc." In this case, the question at issue is simply whether Shaw does, or does not, hold the view as stated.

Ordinarily about half of the items in a test should be true and half of them false. The arrangement of the items should be irregular and without any set pattern. Also, each item should be independent of all other items.

Statistical tests of the reliability of true-false tests prepared by teachers often show them to be unsatisfactory, and, for that reason, other forms of objective tests are to be preferred as the primary basis of class marks. However, these tests may be used to give students excellent training in the use and understanding of language. A method that has been used at the college level for that purpose is explained below. It should also be applicable in high school courses.

Each student is asked to make out a true-false test of some fixed number of items covering a given assignment. Ordinarily these should be distributed rather uniformly over the assignment. If, for example, 20 statements are based on 40 pages, an effort should be made to base one statement on each two pages, and the statements should follow the same order as the assignment.

The test may be administered somewhat as follows: A student is asked to read his No. 1 statement to the class. The statement is read twice slowly and distinctly without comment, and the other members of the class make a record of their answer. Another student reads No. 2, and so on through the class until all of the statements have been read. Then student No. 1 reads his statement again and gives the scoring as true or false. Students who disagree with the scoring may at this point ask for an explanation, and in case the reply is not satisfactory, it is up to the formulator of the statement to defend his interpretation. In any argument that may result, the teacher keeps to the sidelines as far as possible and permits the class to settle the question, though prolonged discussion is usually to be avoided.

This method trains students both in expressing ideas and in interpreting statements more accurately. Students will naturally feel much more freedom to discuss items critically when these have been made by other class members than when they have been made by the teacher, and, in the writer's experience, most college students enjoy this type of exercise.

These class tests will be treated more seriously if students make a duplicate set of answers on slips of paper and turn one of these in to the teacher before the test is corrected. If this is done, the duplicate slips may be corrected and some credit given.

True-false tests are usually scored by subtracting the number wrong from the number right. This method is based on the assumption that when a student guesses he will get about the same number of items right as he will get wrong. Hence on a test of forty items, if he knows twenty and guesses at twenty, it is assumed that he will have about ten right and ten wrong out of the twenty guesses, or a total of thirty right and ten wrong. Right minus wrong, or thirty minus ten gives twenty, which is the number he is supposed to have known. The weakness in this reasoning is that there is a large chance of error in such corrections for guessing which causes most of the students to get either more or less than they deserve. Largely for this reason, it is at times recommended that no correction be made for guessing. However, if this is done, it is to be understood that a score that is 50 per cent of a perfect score represents about what would be obtained simply as a result of guessing.

Multiple Choice Tests.—Simple multiple choice tests are in this form:

A cactus is (1) an animal, (2) a plant, (3) a mineral, (4) a manufactured product.

Such tests are liked by students because they are usually free from ambiguity and they are relatively easy. Many multiple choice tests require only that the correct answer be recognized and consequently they are called recognition tests as opposed to tests that require recall.

This form of test is very widely used in standardized tests, but really good multiple choice tests are difficult to make. If the options are not well chosen, the right answer may be determined by a process of elimination.

Test items can also be made to test judgment and reasoning, but this is harder to do, and such tests require a relatively long time for administration.

The easiest way to score the multiple choice test is simply to count the number of right answers. If a correction for guessing is to be made, the formula is,

$$\text{Score} = \text{No. Right} - \frac{\text{No. Wrong}}{N - 1}$$

The N in the formula stands for the number of choices from which the student chooses the correct answer. In the item about the cactus, which was given above, there are four choices, so $N = 4$.

Again let us suppose that a student takes a test of forty items and that he knows half and guesses at the other half. He gets twenty right because he knows them. He guesses at the other twenty; and, since there are four choices, he is assumed to get one-fourth right; hence he guesses five right and fifteen wrong. His test score is, therefore, twenty-five right and fifteen wrong. Substituting in the formula we have:

$$\text{Score} = 25 - \frac{15}{4 - 1} = 20.$$

This correctly gives the number our student is credited with knowing in the first place. As in the case of the true-false test, there is some chance error in the use of this formula with multiple choice tests, but the error is not so large.

If students are encouraged to answer all questions, the correction for guessing may usually be disregarded without serious error.

Completion Tests.—The completion test consists of a statement from which some essential word has been omitted as,

A is a male deer.

In some cases the correct number of letters in the omitted word is indicated by putting the number in parentheses in the blank, thus,

A —(4)— is a male deer.

As generally used, this test requires recall and so is more difficult than the simple multiple choice test. It is somewhat limited in its application, however, for the reason that the statements should be

of such character that one and only one word can be properly used to fill in the blank. For example,

..... was President of the United States.

Obviously this could be answered correctly with the name of any president.

In general it is better if only one blank is left in a statement. Novices in test construction often make completion tests with several blanks. This practice makes for unnecessary confusion and will tend to lower the reliability of the test. It is better to use a larger number of shorter statements with only one blank in each.

A variation of the completion test, which is at times desirable, may be had by supplying the answers for a group of completion test items. Several additional answers are added, and the total group of answers are arranged in alphabetical order. This variation turns the test into a multiple choice test; but in this case the chance of guessing the correct answer is greatly reduced.

Matching Tests.—The matching test consists of two sets of items, preferably in parallel columns, which are to be matched. As an example:

- | | |
|-----------------|-----------------|
| 1. Denver | A. New York |
| 2. Chicago | B. Pennsylvania |
| 3. Philadelphia | C. Illinois |
| | D. Colorado |

The items on the left are considered as questions and the items on the right are considered as answers. Additional answers are supplied in order to decrease the chances of guessing correctly. These tests can be made to require more than simple memory, and, if ten to twenty items are included in each test group, the guessing factor should not be important.

Matching tests are often constructed so that each item in the answer column is used only once. If this is done, and if students are permitted to check off the answers they have used, errors made in the early part of the test tend to cause further errors on later items. If, for example, the correct answer for the second question is D, but

a student erroneously uses G as the answer and checks it off as having been used, when he comes to the question for which G is the correct answer, he is encouraged to make a further error. This difficulty can be avoided by making tests in which some of the answers are used more than once. If this practice is announced to the class, and if they are told not to check off the answers used, the type of error mentioned above can be minimized and the reliability of the test increased. The chances of successful guessing are also decreased.

Use of Several Tests.—Inasmuch as different tests measure somewhat different abilities, it is generally desirable that different kinds of tests be used. Some students do comparatively better on one kind of test than on another kind, and, for that reason, if one kind of test is used exclusively, the differences in marks will not accurately represent average differences in achievement. In most cases a combination of essay and of objective tests is to be recommended.

Administration of Tests.—Even objective tests may be read to students orally, but this is ordinarily not to be recommended. It places too much of a premium on good hearing and does not give the student much opportunity to consider the implications of the question. It is much better if possible to give each student a mimeographed copy of the questions.

Separate answer sheets have come into common use in connection with standardized tests, particularly to make machine scoring possible. Even when machine scoring is not used, the separate answer sheet has definite advantages. It makes it possible to keep, and to use again, the same question sheets. This saves time, trouble, and expense, and it reduces time and errors in scoring tests. However, it also introduces the possibility of serious errors. Some students manage to get confused and to get their answers in the wrong place on the answer sheet, and this, of course, is disastrous because machines do not recognize such errors. When students using separate answer sheets get very "unusual" marks, it is wise to examine the answer sheets critically to determine possible mechanical sources of error.

For some years the writer has given many objective tests by having the answers put on ruled paper cut into one-inch strips. As an example, we will suppose that a true-false test of sixty items is to be given.

The student takes a slip of paper and, beginning on the first line, numbers from 1 to 30 on the left-hand side of the slip. The slip is then turned over, and, again beginning on the first line, the other side is similarly numbered from 31 through 60. For this number of items, ruled paper with lines one-fourth inch apart will be necessary.

On the true-false test, a plus sign is used for true and a minus sign for false, and the appropriate sign is placed on the extreme right edge of the paper after the question number. Plus and minus signs are used rather than T and F because scoring is easier and more accurate. Also this system makes it easier to make changes. A minus may be changed to plus very simply, and when a plus is to be changed to minus, a circle is made around the plus, and a minus sign is written above it.

When these slips of paper are to be scored, they are pasted together so that only the right edges of the slips are exposed. If the slips have been filled out uniformly, it is then possible to score each item of the test separately and to determine the number of errors made by the entire class on each item. This information is necessary for the most effective teaching and is one very important advantage of hand scoring over machine scoring. Machine scoring does not now give such an item analysis.

It takes some training to get students to fill out answer slips correctly, and just how far down in the grades such a system would work cannot be stated accurately, but it does pay dividends in making it possible to get a more accurate understanding of the extent of class errors on different items of a test.

Names are written on the answer slips on the edge under the answers, so that when the slips are pasted together the names will be exposed.

If the teacher does not find it desirable to paste slips together, then wider slips will be somewhat easier to handle for ordinary scoring.

The use of separate answer slips also makes it possible to have students score their own papers immediately after the test is given. In this case each student is given two slips of paper and the answers are filled out in duplicate. When the test is finished, the teacher collects one set of answers which she corrects in the usual way. After collecting the answers, she reads the correct answers to the class and each student corrects the duplicate slip. This procedure makes it possible to correct immediately the errors that have been made and to avoid fixing false ideas as a result of the test. Each student records his score at the top of the slip of paper and turns it in to the teacher. The teacher compares this score with the score obtained when she corrects the duplicate, and she reports back to the class any discrepancies. In case of disagreement, the slip turned in before the papers are corrected is, of course, the one that is used as a basis of the accepted score. This makes it impossible for the student to change answers to his own advantage. Good teaching requires that errors be located and corrected, and this system gives immediate and individual corrections of errors.

Experimental evidence to support the suggestion that better results will follow if tests are corrected during the class period in which they are given has been supplied by Little.¹⁰ In this experiment, machine scoring was used. A distribution of the scores made by the class was placed on the blackboard so that each individual could see his position in the class group. Then the correct answers to the questions were given and explained as far as time permitted. In this way errors were corrected immediately. In order to compare the results obtained by the use of this method with those given by the customary method of correcting tests outside of class, an experimental group and a control group were tested later on the same material and it was found that the experimental group made higher scores. A comparison of the final scores of the two groups appears in Figure 31.

One problem that is always with us in connection with tests is that of honesty. Experience and experiments agree that dishonesty may be expected to occur even in college groups with a good social background. In a few schools honor systems appear to function

effectively, but these are exceptional. In most cases teacher supervision is necessary.

Some students will resort to all kinds of devices and will spend a great deal of effort to get better marks by devious methods. The writer has found it most satisfactory to treat this problem openly and frankly. Students are seated, whenever possible, in alternate seats and are told that during the test they are to avoid looking even in the direction of another paper. If it is not possible to seat students in alternate seats, an examination may be broken up into two or more parts and students in the odd-numbered seats may do

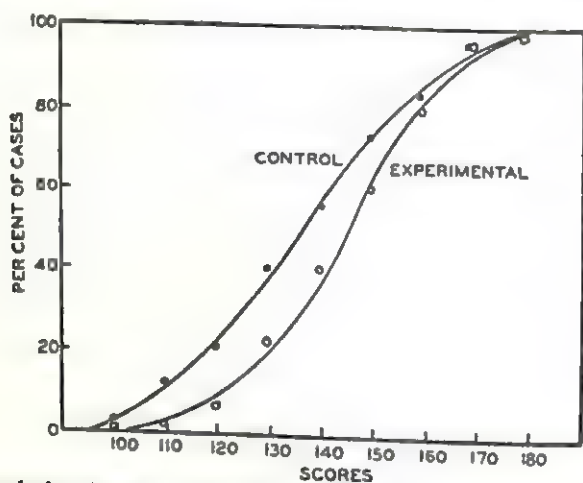


FIG. 31.—Cumulative frequency graph showing the results of correcting objective tests during the class period in which the test is given. Adapted from Little (10).

one part while students in the even-numbered seats do another part. Properly administered, this procedure greatly reduces the possibilities of dishonesty. One teacher followed the practice of seating all of the poorest students together in the front of the room. This naturally would tend to discourage copying. Probably of most importance is that the teacher be aware of the problem and be alert to eliminate common sources of trouble. More fundamentally, of course, fair and definite assignments, fair tests, and fair marking practices will help to reduce student temptation to be dishonest.

Conflicting Philosophies and Measurement.—At the present time there are wide differences of opinion as to the kinds of meas-

urements and appraisals that are desirable, and this difference is especially great at the elementary school level. The more general practice is to give some kind of mark in each subject field to indicate the level of achievement in comparison with supposedly "absolute" standards, or else in terms of group norms. Reports are also made on behavior, but these latter reports are often considered to be of relatively little importance.

In contrast to this general practice, we find some educators who oppose the use of competitive marks and favor more descriptive and analytical statements with emphasis on social behavior. In many cases these educators favor conferences between teachers and pupils or between teachers and parents rather than any form of mark or any kind of formal report.

These differences are especially marked with reference to the question of failures. The traditional practice has been to fail pupils who fell sufficiently far below approved norms and to require that pupils repeat grades or subjects until minimum standards could be met. In recent years, however, and especially in elementary schools, many educators have opposed the practice of failing pupils and have favored a policy of automatic promotions regardless of achievement.

As Wallin ²² points out, automatic promotions do have certain advantages. Three of these deserve special mention: (1) the plan avoids the bad mental hygiene that is often associated with failure; (2) the child associates with children of his own age; and (3) both parents and children tend to be pleased.

But Wallin also notes that some of the teachers are not pleased with a system of automatic promotions. With reference to the social criterion, which is usually emphasized in this connection, he quotes several teachers as follows: "Social age has some claims, but we don't develop the whole child merely by promoting him"; "One or two years does not make much difference as far as social age is concerned"; "The retarded child fits in better socially, mentally and educationally with younger children"; "The retardates cannot compete either socially or mentally with their own age group"; "The mentally deficient is not socially ready for his own age group."

Fundamentally these differences in attitudes toward automatic promotions seem to stem from different educational philosophies and different educational objectives, and, as has already been pointed out in this volume, it is not the proper function of science to make a choice between rival philosophic positions. We shall not, therefore, attempt to say which philosophy is correct; instead, we shall confine ourselves to a consideration of some of the psychological aspects of these different systems of appraisal. If marks and grades are to be given, as in fact they commonly are, they should be valid, reliable, and meaningful. We shall accordingly turn next to a consideration of problems associated with school marks.

The Functions of Marks.—Some of the functions of tests, which we have mentioned previously, will also apply for marks and grades, especially with reference to motivation. Marks do stimulate many students to work harder than they otherwise would work. But marks also have other uses.

In most schools, marks are important in determining progress through the school system, and this function increases progressively in importance at higher grade levels. In most schools a child may fail and be required to repeat a course or a grade. Satisfactory marks in high school are required for admission to colleges and universities, and some colleges will not admit a student who has not received high marks in high school. Some specify that the student must have been in the top third of his class.

In high schools, in colleges, and in universities, there are honor societies, such as Phi Beta Kappa, which base their elections largely on achievement as measured by marks. In addition, there are many scholarships that are reserved for students who have received high marks. Also, even in case of loans and grants in aid, there is usually some minimum standard of achievement which is expressed in terms of grade averages.

Employers, also, are very often interested in the marks made by prospective employees, though this will, of course, depend on the intellectual level of the job in question. In general, quite obviously, the higher the position, the greater the importance of the academic record.

In view of these facts, it is evident that marks will play an important part in student counseling. For example, the boy who has consistently made low marks in mathematics will not be encouraged to prepare for a career in engineering. The counselor will endeavor to bring about a reasonable balance between a boy's level of aspiration and his ability. However, in order to do this most efficiently, it will be necessary to consider the achievement level and profile as indicated by a cumulative record of marks. In the absence of such records, the counselor will be greatly handicapped and will almost inevitably make larger and more serious errors.

PSYCHOLOGICAL AND STATISTICAL FOUNDATIONS OF MARKS

Individual Differences in Achievement.—We have already pointed out that the individuals in a group usually differ in the degree to which they possess psychological characteristics. This is true generally with respect to achievement in school. Properly constructed achievement tests tend to show a continuous gradation in the abilities of pupils in a particular class, and one of the chief purposes of school marks is to express in accurate and understandable form the degree of each pupil's achievement.

When attempts have been made to apply the foregoing idea to marking systems, it has often been assumed that the distribution of abilities in ordinary classes would generally conform closely to the theoretical normal curve. This, however, is very often an unwarranted assumption. On theoretical grounds, when certain conditions are met, we may expect a close approximation to a normal curve if we have a very large number of unselected cases. Consequently, if marks are to be fair and accurate, it will be necessary to make proper allowances for variations in class groups. Methods for doing this will be discussed later.

The Unreliability of Marks.—All measurements are to some extent unreliable, and, unfortunately, the measurements of pupil achievement that are made by classroom teachers are often extremely unreliable, as has been shown by numerous investigations. (Cf. 19, pp. 512ff.) In the classical experiment with a geometry paper, 114

geometry teachers in the North Central Association marked the same paper and assigned marks ranging from 28 to 92!

However, while measurements of classroom achievement are often very unreliable, judgments and appraisals of personality and behavior characteristics have been shown to be of even lower validity and reliability. This means that those educators who are especially interested in personality and character development will find it most difficult to determine the results actually produced by their teaching.

This unreliability is due to many factors, but, in essay and oral tests and examinations, much of it is due to individual differences and to inconsistencies in the examiners themselves. Not only do different teachers assign different marks to the same paper, but the same teacher has been found to give quite different marks to the same papers when these have been marked at different times, and especially when the teacher has not known the names of the pupils who have written the papers. This inconsistency shows that if we are to have reasonably valid and reliable marks we must develop methods that will tend to minimize the importance of the personal equations of the teachers who give the marks.

The Problem of Norms.—A generation or two ago, school marks were very commonly stated in terms of what was known as the percentage marking system. Perfect papers were marked 100 per cent, and passing marks were stated as being 60, or 70, or perhaps 75 per cent, with the assumption apparently being made that a mark of 60 per cent represented 60 per cent of a perfect knowledge of the subject. However, when early experiments on the marking of papers showed that teachers varied so greatly in their marking practices, it became evident that a mark of 60 per cent, or of 75 per cent, was of very uncertain meaning: in one case a mark of 75 per cent might represent the best achievement in a large class, while in another large class the lowest mark in the class might be higher than 75.

As a result of these studies, the percentage system of marking on a supposedly absolute scale was very widely abandoned, and marks came instead to be based more generally on actual class performance. At the present time, marks are usually to be interpreted as indicating

position in a class group as average, as inferior, or as superior. Norms, therefore, now tend to be based on what pupils do rather than on arbitrary theoretical standards set up by teachers.

As it happens, however, class groups as well as individuals show marked differences in achievement, so that two marks, which indicate average achievement in two different classes, may represent very different degrees of mastery of a subject. For this reason, norms based on small class groups may be quite variable and unsatisfactory. A partial solution to this problem will be presented later.

MARKING SYSTEMS

Percentage Marks.—In spite of the shortcomings of percentage marks as stated previously, such marks continue to be used in many schools. It is of the greatest importance that teachers who are required to report marks in terms of this scale understand that such marks are relative rather than absolute. The teacher who chooses to do so may make out a list of easy questions and may then mark the answers on a very charitable basis with the result that a mark of 90 per cent on one test represents less than a mark of 50 per cent on another test. In fairness, therefore, to pupils, it seems that in schools where marks are reported in terms of the percentage system, it would be better first to mark tests on the basis of any convenient point scale and then to convert these raw scores to "percentages" that would conform to desirable marking standards. This can be done by using modified T-scores, as will be explained later. Unless some such modification is made, percentage marks will often be unfair and of very uncertain meaning.

Letter Grades.—A considerable number of letter systems of marking have been used. Many of these use A, B, C, and D, followed by E or F, or by F and FF. Some have used E, G, F, and P (excellent, good, fair, poor). Some use R, P, and F (recommended, pass, fail). Some use only two marks: pass and fail, or satisfactory pass, fail). Some use numbers instead of letters, as 1, 2, and unsatisfactory. Some use numbers instead of letters, as 1, 2, 3, 4, 5, 6, and 7, with 1 as the highest grade. Many of these systems also use plus and minus signs so as to give a more finely graded scale.

These letter marks have often been defined in terms of group distributions by saying, for example, that the middle 50 per cent of a class would be given C's, the next 20 per cent above this middle group would be given B's and the top 5 per cent A's. Similarly the 20 per cent below the middle group would be given D's and the lowest 5 per cent F's. In some schools teachers who failed to conform to the prescribed pattern of marks have had their marks revised before the marks have been recorded.

What are some of the merits and demerits of these letter systems?

Originally they probably served a useful psychological function in helping teachers to think in terms of group performance rather than in terms of supposedly absolute scales. A mark of C meant average performance, regardless of how high or low that average might be. In case a given level of achievement did not satisfy a teacher, the remedy was to be found in further and better teaching and not in maintaining "standards" by giving a large number of low marks. This change in attitude may be regarded as a major advance in the theory and practice of marking.

It has also been urged that a letter system is more convenient and avoids a pretense of greater accuracy than is possible for most teachers. This is perhaps true in some cases but not in others. When papers and some essay examinations are marked, or when laboratory and other activities are to be graded, a coarse scale will at times be easier to use. But when other essay examinations or objective tests are used, or when laboratory work is to be graded in detail, a coarse scale may not be satisfactory. In such cases the point scores may give a continuous distribution which covers a considerable range from the highest to the lowest score. If, in such cases, a five-letter scale is used, there will be numerous cases of pupils with borderline scores, and it will be necessary to assign one pupil a C while a pupil with a score only one point higher will be given a B. The net result of this is that marks are made unnecessarily unreliable. Greater accuracy would result if the marks were stated in terms of a finer scale, and preferably in terms of a numerical scale, though the error would not be serious if letter grades were supplemented by plus and minus signs.

Another objection to letter grades is found in the fact that it is a common practice to determine grade-point averages; and since letters cannot be averaged, it becomes necessary to convert the letter grades into numbers in order to compute the desired averages. It would, therefore, be simpler to use numbers in the first place. This principle also applies when numbers are used with a "1" representing the highest mark. Less confusion will result when higher achievement is represented by higher numbers.

It has been the writer's observation while serving on a college admissions committee that the three-letter marking system of R, P, and F does not afford an adequate degree of discrimination between the high and the low R grades. This may not be important when the high school student is applying for admission to a state university, but when he is applying to a private college which accepts only a fraction of the qualified applicants, the coarseness of the R marking is definitely a handicap to the better students.

The pass and fail systems of marking are, of course, even less satisfactory when decisions are to be reached which require a more accurate appraisal of a student's achievement. For this reason it is common practice when such systems are used to require a supplementary statement in writing from the teacher; but when a teacher has large classes, these statements are unlikely to be very helpful.

The writer once tried an experiment with a psychology class of about 60 students to determine student reactions to different marking systems. Several different marking systems were explained to the students and they were then asked to indicate their preference for these systems by ranking them in order. After these ranks were turned in, the class was told that their next test papers would be marked on the basis of the scale that each had indicated as his first choice. This was done, and 8 of the 60 students who had expressed a preference for the pass-fail marking system were told that they had passed. This information, however, did not satisfy them, for all of the 8 came to the instructor and asked for a more accurate statement as to what they had done on the test. This result is in agreement with numerous studies which have shown that a knowledge of progress is an important factor in stimulating the learning of a

student. For this reason, the pass-fail system of marking seems inadequate, at least beyond the junior high school level.

When letter systems are used, one of the problems is to define more precisely the meaning of each letter, and this resolves itself statistically into the problem of dividing a normal distribution into a number of segments. To some extent this is a matter of taste and expediency, but it is at least desirable that teachers understand somewhat better certain statistical aspects of the problem.

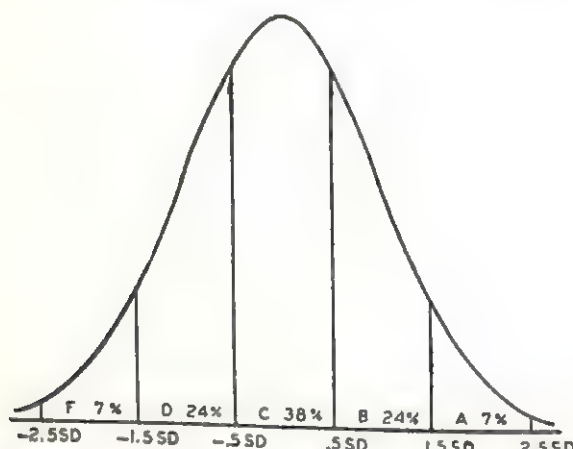


FIG. 32.—The normal curve divided into units of one standard deviation (SD). When this is used as a basis of assigning letter grades it tends to give the theoretical percentages for each letter grade as indicated in the chart.

One rational and defensible method of assigning letter grades is to consider the distribution as representing a range of 5 SD's (standard deviations) and then to divide the range into five equal segments of one SD. This is illustrated in Figure 32. This may be done by first finding the average or mean score and the standard deviation. The middle or C grade is then defined as including all scores between plus .5 SD and minus .5 SD from the mean. Marks of B are given to those between plus .5 SD and plus 1.5 SD, and marks of A are given to those above plus 1.5 SD. Marks of D and F are similarly determined below the average.

When this system is used, the theoretical expectation is that about 38 per cent will receive marks of C, about 24 per cent will receive marks of B, and about 7 per cent will receive marks of A.

Similarly, about 24 per cent and 7 per cent will receive marks of D and F respectively.

If, in contrast, it should be decided to give some other percentage distribution of marks such as 5, 20, 50, 20, and 5, the normal curve would be divided as is shown in Figure 33. In this case the middle group covers a range of about 1.35 SD's while the B and D groups cover theoretically slightly less than 1 SD. This means that the units of our grading scale are not equal.

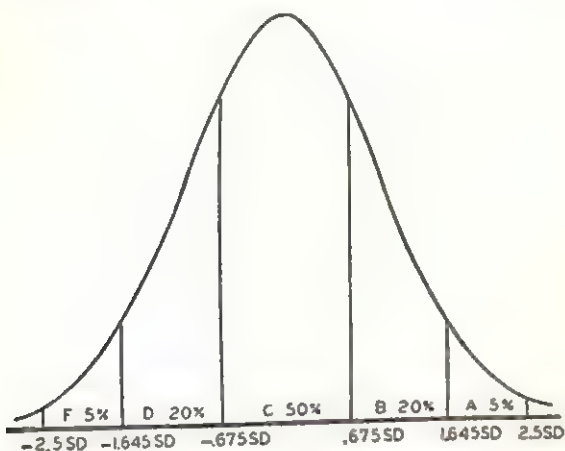


FIG. 33.—The normal curve divided to give 50 per cent C's, 20 per cent each of B's and D's, and 5 per cent each of A's and F's. As will be seen from the figure, this percentage distribution of marks normally requires unequal scale distances for different letter grades.

Perhaps the most important consideration here is that some agreement be reached as to the meaning of the marks used, and that all of the teachers in a school or school system follow uniform practices in their marking. Otherwise a C in one course may represent something quite different from what it represents in another course.

Standard Score Scales.—In order to be really satisfactory, a marking scale should be expressed in numbers, with the higher numbers representing the higher degrees of achievement, and it should be more finely graded than letter scales. This could be obtained by using a T-score scale in which there is an arbitrary average score of 50 and an arbitrary standard deviation of 10. However, in defer-

ence to popular usage, it might be more desirable to use an arbitrary average of 75, rather than 50; but the standard deviation could very well be 10. In this case a mark of 85 would be 1 SD above the average, and a mark of 100 would be 2.5 SD's above average.

TABLE 5. MODIFIED T-SCORES AND LETTER-GRADE EQUIVALENTS
The mean score is 75 and the SD is 10

<i>Scores</i>	<i>Letters</i>	<i>Numerical Equivalent</i>
96.67+	A+	98
93.34-96.66	A	95
90.00-93.33	A-	92
86.67-89.99	B+	88
83.34-86.66	B	85
80.00-83.33	B-	82
76.67-79.99	C+	78
73.34-76.66	C	75
70.00-73.33	C-	72
66.67-69.99	D+	68
63.34-66.66	D	65
60.00-63.33	D-	62
56.67-59.99	F+	58
53.34-56.66	F	55
0.00-53.33	F-	52

While this scale is theoretically better than other scales, not many teachers would use it accurately even if it were adopted. One partial solution for the problem would be to define the scale in terms of letter equivalents, as is shown in Table 5. This would make it possible for teachers who prefer to think in terms of letters to report numerical grades with no real difficulty. Instead, for example, of reporting a B-, a mark of 82 could be reported. At the same time, this system would permit the more statistically minded teachers to use the scale more accurately.

This scale would solve the problem of the borderline mark. Instead of debating whether to report a mark of B- or C+, the teacher could simply report a mark of 79 or of 80. Also grade point averages

could be computed more accurately than when letter grades are used. Errors of measurement would be reduced, and correlations between achievement and intelligence would be increased.

Allowing for Selection.—The average ability of small classes is likely to vary considerably, both because of chance and because of selection. Hard subjects, such as classics and mathematics, will, for example, tend to be avoided by the less able students. If, then, a marking system is to be equitable, some allowance must be made for the variations in the abilities of different classes (Cf. 4).

In order to make this adjustment, we need, first of all, some index of the abilities of individual students. This could be obtained by giving intelligence tests and standardized achievement tests to all of the members of a freshman class. These scores could next be suitably weighted and combined into a single score for each student; and this set of scores could then be converted into the marking scale suggested above, with an average of 75 and a standard deviation of 10. These converted scores might be called index scores.

If each teacher were supplied with a distribution of the index scores of the students in each of her classes, it would be easy to determine whether any given class is below average, average, or above average in ability; and marks could be adjusted accordingly. On this basis superior classes would get more high marks, while inferior classes would get more low marks.

Weighting Scores.—The accurate weighting of different scores that are combined to make a single total score is a difficult statistical problem; but one aspect of it deserves mention here. Weights depend on variabilities rather than on averages; and when scores are averaged, variabilities are reduced. When, therefore, a semester average is computed for class work, the spread of these averages will tend to be less than the spread of the marks on the individual tests. If no correction is made for this reduction in the variability of the average scores, two results are likely to follow: (1) final examinations will be given more weight than intended; and (2) the percentages of high and low marks will be lower than on single tests. For this reason it may be desirable to reconvert final marks to the desired marking scale.

Problem of Evaluation.—This chapter has been devoted mostly to the measurement of achievement in ordinary school subjects. At the same time, we should recognize that many teachers are more concerned with appraising other results of school experience, and that all teachers are concerned with the significance and value of the obtained measurements and their relations to educational objectives. We have not attempted to go into these problems because the problems themselves are too complex, and scientific psychology has relatively little to offer to the practical teacher in dealing with such matters.

However, we have learned that judgments of personality traits and of attitudes are subject to very large errors even under favorable conditions. Obviously, then, when teachers are required to teach large numbers of children—and some high school teachers have more than 200 pupils in their classes—very little of value can be expected from attempts to appraise a child's total personality. When classes are very small and a teacher has a great deal of contact with only a few pupils who are engaged in activity projects, there will, of course, be a much sounder basis for rating personality and behavior traits; but even here great psychological insight and caution are needed. This suggests the need for special training which goes beyond the limits of a general course in educational psychology.

QUESTIONS AND EXERCISES

1. Why are standardized tests inadequate for most classroom testing?
2. What are the chief functions of classroom tests?
3. What are the special values of final examinations?
4. How may a teacher use tests to improve her teaching?
5. How may the validity of classroom tests be increased?
6. Why is it desirable that different types of tests be used to measure classroom achievement?
7. What are the desirable and the undesirable features of essay tests and examinations?
8. How may the accuracy of scoring essay tests be improved?
9. Why is the reliability of true-false tests often low? What are some of the special precautions to be observed in constructing true-false tests?
10. Explain the theory of scoring true-false tests by subtracting the number of errors from the number of right answers.

11. What are the advantages of separate answer sheets? What are some of the dangers associated with their use?
12. What are the benefits that result from correcting tests in class immediately after they have been given?
13. What are the chief arguments for and against the use of letter marks instead of a finer numerical scale?
14. Why is a passing mark of 75 (or other) per cent of uncertain significance?
15. How may allowances be made for selection in assigning marks to different classes so that superior groups will receive more high marks and inferior groups more low marks?

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CHAPTER 13

EFFICIENCY IN STUDYING

Beyond the first three or four grades it seems safe to say that most of the learning that takes place occurs as a result of the reading and studying done by pupils and students. At the college level, it is usually assumed—somewhat incorrectly—that the average student will spend two hours of study for each hour of attendance at class. This in itself is sufficient to indicate the desirability of training pupils to work with maximum efficiency. On this point Traxler comments as follows¹⁰ (p. 286): “Of all educational objectives, few are more important and none is more difficult to achieve than the development of efficient, independent, permanent study habits and skills.”

Certainly one of the purposes of school training is to bring students to the point where they are able to use books and libraries efficiently and to read easily for recreation or to secure information on new subjects; for sooner or later they will quit school and it will then be their responsibility to continue their education without the benefit of guidance from a teacher. With this in mind we may agree with Traxler that one of the continuous objectives of teaching should be the improvement of the study habits and techniques of the students.

Courses on techniques of reading and study are often given in college and occasionally in high school, but, as a matter of fact, study habits tend to be formed in the early grades, and, in most instances, do not materially improve after the elementary school.^{5,10} Yet different study techniques are required for the highest efficiency in different subject areas and in dealing with different types of material in the same subject. Also, as the student climbs the educational ladder, he will normally find it necessary to pay an increasing amount of attention to meanings, general principles, applications and integration. In other words, higher levels of intelligence must be used

for the proper mastery of materials in more advanced courses, and this is frequently one of the more difficult adjustments which students have to make when they enter college.

While we shall be concerned here primarily with the development of student efficiency in studying, it is important to recognize very clearly the fact that to a very great extent the efficiency of the student will depend on factors over which he has little if any control. These factors include such things as the content and organization of the curriculum, the guidance and classification of students, graduation requirements, the nature of assignments, teaching procedures, provision of satisfactory places for study, and so on.

If the curriculum is not properly adapted to the mental maturity, to the past experience, and to the needs and the interests—actual or potential—of students, it is likely to be difficult and perhaps impossible to get a class to study effectively, but if the curriculum has been well planned and if students are properly classified and taught, it may be relatively easy to get at least the majority of the students to work with enthusiasm and efficiency, although because of individual differences there are likely to be some students in most class groups who will present special problems and who will need individual assistance in the development of adequate motivation and good study habits.

Although group projects and discussions are often valuable, a major part of learning occurs as a result of individual reading and study, and for this it is desirable that the school provide suitable places. Libraries should, in general, be quiet: it is too much to expect a student to study effectively when other students are carrying on a conversation. It also implies that, in general, it will be better for students to live and study in single rooms in dormitories rather than to share the same room with one or more other students.

The Teacher's Contribution.—Nearly everything that the teacher does in teaching will influence, either favorably or unfavorably, student efficiency in studying, but special attention may be called to six points at which the teacher can help:

1. *Definite assignments.* By outlining to a class just what is wanted in the way of preparation, a teacher will increase greatly the probability that the desired work will be done. Indefinite and vague assignments, on the other hand, will usually result in wide individual variation in what is done by different members of a class group.

2. *Announcement of tests.* Some teachers give unannounced tests from time to time, apparently on the theory that this will cause the students to work regularly. There is more to be said, however, for a definite schedule of tests which is announced to the class. This permits the class to make plans and it tends to ensure preparation by all class members for the test.

If, in addition, the type of test is announced, the class will tend to make appropriate preparation and this should increase both the validity and the reliability of the test.

3. *Motivation.* Those students who have the greatest difficulty in studying are probably as a group also most lacking in adequate motivation. For this reason the teacher needs to be especially careful to point out the value of the material and to show how it is related to student needs and interests.

4. *Study techniques.* Since different study techniques are needed for the best work in different subjects and in different parts of the same subject it is very desirable that the teacher explain from time to time the best methods of mastering assignments and, as far as is practicable, the reasons for the superiority.

5. *Special difficulties.* In many instances teachers can be of great assistance by explaining new words, especially difficult technical terms, and by clarifying other points that are likely otherwise to cause unnecessary confusion and loss of time. Textbooks are often deficient in that they do not contain glossaries or adequate explanations of terms used, and, when this is true, the teacher is likely to be the best available source of information for the class.

6. *Individual counseling.* It is practically impossible to make class instruction meet the needs of all students. On one occasion the writer had in class a student who had exceptional difficulty in understanding assignments. As a result, it was usually necessary

to give him supplementary instructions, but, once he understood the problem, he did better than average work.

This type of work often requires a great deal of time and if the teacher has very large classes it may be impossible, but, when time permits, it is one of the most important functions of the teacher.

A STUDY GUIDE FOR STUDENTS

Physical Condition.—It is fairly generally recognized that if one is to be capable of superior physical performances he must be careful to follow certain rules of physical hygiene and he must train himself physically for the performance in question. For mental work, in contrast, students often act as if mental activity were unrelated to body metabolism. They will go without proper food, stay up most of the night before an examination, fail to get proper physical exercise and recreation, and still be surprised when an abused nervous system fails to respond as desired during an examination.

The nervous system will stand a lot of abuse and, when possible, will draw on the rest of the body for nutrition; but fundamentally the nervous system, like the muscular system, uses energy and becomes fatigued. It then requires rest in order for a proper recovery of function to take place. Consequently when a student works for excessively long hours and does not rest, the result will be a loss of capacity. In some instances the associative functions quit to such an extent that the student is unable to answer questions about things that he ordinarily knows very well. It is, therefore, imperative that students learn to observe reasonable rules of physical and mental hygiene if they are to be able to study efficiently. This means that the student must have enough but not too much of the right kind of food. Roast pork and sweet potatoes may be a satisfactory diet for manual laborers, but neither of these foods can be recommended for those who are working with intellectual problems. The average young adult seems to require about eight hours of sleep for the best mental work, although there are wide individual variations here, and there will also be seasonal and climatic variations. In addition, there is the need for physical exercise. This seems necessary in order to keep the entire body mechanism in good

working order, and, more specifically, it is said to assist in relaxing the cerebral arteries in such a way that brain circulation is improved and recovery from fatigue is facilitated.

This need for physical exercise and good mental hygiene indicates simply that we should observe the ancient Greek ideal of a sound mind in a sound body. This principle is the foundation of success in studying as well as in other activities.

Visual Defects.—Learning, in general, begins with sensory experience, and, for this reason, we might fail to learn properly because of defects of any of the senses, but, in studying the assignments that teachers give, the eyes are usually of most importance, particularly in the field of reading.

It is relatively rare for an individual to have two eyes that are equally good, and it would be even more unusual to find an individual with two eyes capable of 20/20 vision. Astigmatism is very common and is generally more serious in one eye than in the other one. For these reasons a large proportion of the students who do not feel that they need to wear glasses would, none the less, find it easier to study effectively if they would wear glasses during the time they are studying. In this way optical defects could be corrected and the two eyes could be equalized so that they could work better as a team.

However, even when the two eyes have been given normal vision by the use of appropriate lenses, there may be a difficulty with binocular fusion and consequently the two eyes may not work well together. When this is the case, the individual is likely to be a slow reader. This is one of the important causes of a lack of efficiency in studying, and consequently it is one of the things that should be tested as a matter of routine in case of most students who are abnormally slow readers. Fortunately binocular fusion can be greatly helped by appropriate exercises, but these take some time and also require special equipment so that such relief may not be readily available for all of those who need such corrective treatment.

The Physical Environment.—It will be much easier to study if the student has a suitable physical environment. This normally

requires a quiet room with suitable furniture, heat, and light, and without some of the distractions that are often present.

Any kind of noise tends to be distracting and fatiguing, but meaningful sounds in the form of conversation or radio programs which include talking are much worse than simple noises. At the present moment the writer is working with the distraction of a power machine which is digging a trench in the street. This is bad but is to be preferred to many radio programs.

Common sense plus actual test^o shows that studying is less effective when a radio is going in the same room, though the poorer students seem to be most affected by the distraction. Instrumental music will usually be less disturbing than talking programs, and classical music tends to be less disturbing than popular music,⁴ but this might well be influenced by the musical background of the hearer. The only safe rule, however, for any person who has difficulty in studying is to turn off the radio and avoid conversation. What can be done about the neighbors is, of course, another matter!

It is also to be recommended that studying be done in a relatively bare room. Certain types of decorations, such as pictures of sweethearts, are especially to be avoided. One gentleman opposed co-educational colleges on the ground that it was too much to expect a young man to concentrate on his intellectual tasks when a charming young lady in the next seat was advertising her charms to him. In the same way, the young gentleman in a college only for men does not improve his chances of concentrating on chemistry when he is constantly being reminded of his love life. Similarly the young lady who loves horses will probably fare better if her study has no pictures or models to suggest unnecessarily that strong interest.

Posture.—The position of the body may be important but the effect varies greatly for different individuals. Some will become sleepy in a comfortable chair or on a couch, while some do their best work in such positions. The man who puts his feet on his desk may favor better blood circulation and more efficient thinking, or he may encourage sleep. Each person will need to learn the posture that seems best suited to his own makeup.

Time Schedule.—Planning is generally necessary for efficiency, and this applies particularly to the observance of a suitable time schedule. The day and week should be divided in such a way as to provide an adequate amount of time for eating, for sleeping, for recreation, for studying, and for other normal activities. Then the time set aside for studying should be divided and scheduled approximately at least for the different kinds of work that are to be done.

Poor students are likely to plan to do more studying than they will actually do. For them it is better to start with a schedule that can be and will be followed and then to increase the study time rather than to start with an optimistic schedule and then fail to live up to it.

It will, of course, be necessary to learn from experience the best distribution of time. Some courses will require more time than expected, and some perhaps will require less.

There will also be important individual variations in the distribution of time during the 24 hours of each day. Some are night workers and can do their best work around midnight, or even later, while others find that the old maxim of "Early to bed and early to rise" pays the biggest dividends. Some of these differences may be due to habit and some may be influenced by body metabolism, but, in any case, we have not yet learned how to control them and for this reason the most we can do is to recommend that the student learn by experience what kind of schedule is best for him and then conform to that schedule.

Use of References.—As a general background for efficiency in studying, the student needs to learn to use a library. He should be able to look up references and then to find them. This will include the use of various guides to periodical literature, including the special indexes in particular fields. If he is permitted to have access to the library stacks, he may find it very helpful to browse through the books in a particular section.

He should learn to judge the probable quality of books and articles by considering the position and training of the authors and the reputation of the publishers. Articles in professional journals, such as *The Journal of the American Medical Association*,

may not always be scientifically sound, but it is usually safe to assume that they are not written by quacks.

Assignments.—The first essential for actual studying is a clear understanding of the assignment, and much of the difficulty that students have is due to failure to know what is expected and when it is expected. One reason for such failures is that assignments may be given at the beginning of the class period and thus may be missed by late arrivals. Or they may be given when students are absent. For this reason it is especially important that students be on hand at the beginning of class periods and that they check carefully either by asking other students or by asking the teacher what assignments have been made during an absence.

In many cases teachers can reduce this difficulty by having assignments mimeographed and being sure that each student has a copy although this will not, of course, prevent the loss of such assignment sheets.

When possible, the student should also make careful note of the time of announced tests and the type of test that will be given. This information, when available, will make it possible to plan the preparation so that it will meet more specifically the requirements for that particular project. If, however, the type of test is not known, it is generally better to prepare for an essay examination rather than for an objective one, because it has been found that, although preparation for an essay examination gives good preparation for objective tests, preparation for objective tests does not necessarily involve the attention to organization that is usually needed for writing good essay examinations.

Beginning the Work.—For the poor student and the unenthusiastic student, who is not working in a supervised study hall, probably the hardest task is to bring himself to begin studying. Studying may be regarded as an evil to be avoided or at least as something that is quite lacking in affective appeal. This difficulty may be further magnified by interesting radio programs, interesting friends, and other attractions. In fact, there is some evidence that superior social adjustment may actually interfere with efficiency

in intellectual achievement when the student is responsible for the regulation of his own hours of studying.

Success in meeting this difficulty will depend largely on ability to assume an aggressive attitude toward the problem and to develop adequate motivation.

If the student will tackle the problem aggressively, he will go to his desk at the scheduled time and arrange his books and papers in readiness for work. Merely by going through the motions of turning the pages and looking over the assignment he should find that his attention will begin to focus on the problem. He should then review carefully the details of the assignment and begin work.

Some will find it easier to begin with easier and more interesting parts of the assignment and leave the harder parts until later, while others will find it easier to begin with the most difficult items. In any case, the most important thing is to get to work on some part of the task ahead. Once the student has reached the point where he can concentrate effectively on the assignment, he can reorganize his efforts according to what the situation requires.

This kind of procedure is necessary in attempting to control attention because we are not able voluntarily to drive interesting ideas out of consciousness and to substitute voluntarily the items on which we are expected to work. Rather we get one set of ideas out of consciousness by developing interest in something else, and it may take considerable effort in working around the fringes of these new problems before we find that we are actually concentrating on them.

Motivation.—As we have already suggested, one of the most serious difficulties for many students is a lack of motivation. They are much more interested immediately in other problems. And this difficulty is increased inevitably by compulsory school attendance, by graduation requirements, and by the fact that course contents are generally determined by teachers whose interest in a subject and whose capacity for it are usually much greater than that of the students who will be having the greatest difficulty in studying.

In many cases the student is probably correct in holding that the teacher is unreasonable and that the assignment is not worth master-

ing for its own sake. This is a most difficult problem, but, even so, it need not in all cases be hopeless.

Sooner or later children will need to learn that in practical living it will be necessary to accept and adjust to a considerable amount of waste, inefficiency, injustice, and various other forms of evil, and that one of the marks of emotional maturity is the ability to carry out cheerfully various tasks that one finds to be lacking in direct interest and possibly even quite objectionable. This implies that self-control and the ability to take punishment are essential for success in the modern world, just as they were considered essential in ancient Sparta. More specifically it means that the individual must learn to accept regulations and the facts of life even if these may, in fact, be unfortunate, unwise, or unjust.

Through a proper approach, a student may be led to accept the idea that satisfactory achievement is desirable even if the project itself seems useless. He may be led to accept the disagreeable task as a personal challenge and a test of his character and personality as well as of his ability. If he accepts this challenge, he may endeavor to make a good record largely for the sake of the good record itself. Certainly millions of soldiers have given their best efforts to perform tasks they did not enjoy, and certainly also millions of civilians have performed with efficiency under conditions which they found considerably less than fascinating.

It is quite true that the foregoing paragraph seems to return somewhat to the idea of formal discipline and to suggest a process of hardening and training of the will. If necessary, this idea could be stated in terms of the Thorndikian theory of transfer, but, regardless of the theoretical interpretation, something of the kind may be regarded as a practical necessity if certain difficult situations are to be met. As various writers have pointed out, some of the softer varieties of modern pedagogy do not prepare the individual effectively for meeting the realities of life. At times, then, the student will either bring himself to use self-control to do something that does not appeal to him, or he will not do the task at all.

It will, of course, be much easier on everybody concerned if the projects required are immediately interesting to the students and

they find it easy to work on them. Moreover, the student can often simplify his own problem by making a special effort to see the significance and value of what he is expected to do. If he deliberately looks for relationships and applications, he will certainly increase his chances of finding the material interesting and worth while.

Review of Previous Work.—In most instances there is considerable continuity in a course, and for this reason one of the best preparations for the study of a new assignment is a review of what has just been done. This helps to fix the old material; it helps to get attention on the subject; and it makes it easier to understand the new.

General View.—The point has been emphasized in earlier chapters that in the majority of learning situations it is desirable to begin with a general view of the entire course, chapter, problem, or project. Students should be taught to do this in studying. One brilliant student did this, when it was possible, by reading a textbook through during the first few weeks of a course. Most students will not be able to do this, but they can do several things that are less heroic. They can read the preface and table of contents of a book; they can read the chapter summaries when available; and they can turn the pages and scan to some extent the contents.

By getting this general view of a course, book, or project, the student will be better able to understand the relation of particular parts to the whole and hence should be able to do better work with less time and effort.

Limiting the Undertaking.—In a general way the limits of an assignment are determined usually by the teacher, but, beyond that, much depends on the student; he may attempt to get only a very superficial view of the assignment or he may attempt to learn all of the details. In general, however, if what the student learns is to have transfer value, it is important that he do well what he attempts to do. In most instances it is better to master a few facts or principles than it is to acquire a more superficial acquaintance with more material. This implies that in many situations the student will find it necessary to show discrimination: he will select certain

important things for mastery and will pass over other material very superficially.

Excellent students who are fast readers and fast workers generally will, of course, be able to cover much more material than can be covered by slow workers. It is, therefore, most important that the slow worker not attempt to cover as much ground as can be covered by other students.

Understanding the Material.—Some material to be learned is largely of the rote memory variety and will need to be learned without the benefit of understanding, but in most situations successful learning will depend on understanding. A special effort should consequently be made to get as thorough an understanding as possible of what is learned.

This better understanding can be promoted by making applications of principles, by looking for original examples, and by looking for meaningful relationships such as those of cause and effect, similarity and contrast, and the relations of parts and wholes.

Understanding is also facilitated, and material will be better understood and retained, if it is well organized. This will, of course, require further attention to the relationships between the different parts of a topic.

Learning for Permanence.—Learning and retention seem to be greatly influenced by the nature of the intention to learn and remember. The student who studies material simply to pass a test, and who has no desire to retain the material beyond the test, tends to forget more rapidly than the student who learns with the intention to remember permanently. Some material is not, of course, worth remembering for a long period of time, but when it is worth remembering, the retention will be better if the student works with the attitude that "Here is something I should know ten years from now."

Vocabulary.—Advances in knowledge are very commonly associated with increases in vocabulary. New concepts and new meanings must very often be attached to new verbal symbols. This implies that after the early grades a suitable dictionary should be

on the student's desk and that it should be used regularly. In this connection, it will be very important for most students to watch the spelling of new words. Otherwise many errors may be made. In a recent case in the writer's experience, a student who meant to use the neurological term "occlusion" used instead "osculation." She wrote: "Osculation involves central overlap and is an important integrative process." Possibly this makes more sense than it should after such a shift in spelling, but in any case it may suggest the need for careful attention to the spelling of new words.

Underlining.—One of the most important aids in studying—when one owns the book—is underlining. By selecting a few of the most important items and underlining them, they can be made to stand out from the others and will tend to be remembered better. It will also be much easier to review these important points in a very short period of time. Underlining may, of course, be supplemented by the use of suitable marginal notes.

Some enthusiastic underliners make use of several colors of ink or of pencils. Important names may be indicated by one color, facts by another color, general principles by a third color, and so on. This practice would make it possible to make a quick review of one selected type of material, but probably few students will feel disposed to go quite that far.

From what the writer has seen of books underlined by college students, he would judge that the most serious error is made by underlining too much. At times practically entire pages are underlined, and when this is done, the purpose of underlining is very largely defeated because it may well reach the point where it is the material *not* underlined that stands out. Excessive underlining also makes it impossible to use the underlining for quick reviews of the most important facts and principles, and this is perhaps the greatest gain from underlining. Consequently, if underlining is to be most effective, it must not be excessive in amount.

Method of Memorizing.—Meaningful material is generally learned more efficiently by something similar to the whole method, but rote memory material is often learned more efficiently by the

part method. In case of the rote material, more drill and review will be needed, and less can be learned. This will be especially true for those students who find it difficult to remember such details as names and dates. For the greatest efficiency, therefore, it will be necessary for the student to vary his method of attack to suit the material he is learning.

Correcting Errors.—The learning process often involves making errors, and improvement is generally associated with a reduction in the number and in the seriousness of the errors made. It is essential, therefore, that the learner give special attention to the problem of locating and correcting errors. When a rat is learning a maze, he will at first enter blind alleys, he will unnecessarily retrace his steps, and he will hesitate instead of proceeding directly from the starting point to the goal. In the process of learning the maze, the rat gradually eliminates the blind alleys and the unnecessary reversals of his path: he learns instead to proceed directly to the goal. In rifle shooting, the beginner is slow and awkward and makes large errors so that his score is low. With practice he will be able to shoot more readily and his errors will decrease, although, because of the nature of the task, errors cannot be entirely eliminated. In solving problems in algebra, the beginner may make many false starts, he may attempt to use the wrong processes, he may make errors in calculation, and he may or may not arrive at a correct solution. If, however, he finally becomes expert in the solution of such problems, he will have reached the point where he proceeds rather directly from the reading of the problem, through the various necessary steps, to a correct solution. He will have eliminated most of the waste motion and the errors. He will check his solution and will be reasonably sure that his answer is correct.

The details of the process of locating and eliminating errors will naturally depend on the nature of the learning process: it will differ in mathematics from what it is in history, and for this reason it will be necessary to adapt methods to the task at hand.

In learning ordinary verbal material, errors can, to a considerable extent, be located and corrected by attempting to recall material and then checking by referring to a text or to lecture or reading

notes. In problems in mathematics it can be done by checking and proving answers.

When a student has unusual difficulty with a subject, he will frequently need assistance in locating and correcting his errors. To some extent he may be able to get the assistance of the teacher, but in many cases it will be very desirable to have a tutor who can give more special help than the teacher could be expected to give. Some colleges prepare and make available lists of students who have been recommended by the various departments for tutorial work, and some teachers require the better students to assist slower students as a part of the regular work of the course.

Self-reliance is an excellent trait within proper limits, but very often even good students would profit from tutorial assistance. In this case the tutor will be doing what the teacher might do but is unable to do because of lack of time. The tutor can locate errors and clear up points that would otherwise be misunderstood. As a result, the student may get a better understanding of the material and may also save considerable time.

For weak students in high school and college, it will often be advisable to have tutorial assistance throughout a course. As an example, a woman student in college, who was very weak in mathematics, found it necessary to take a course in mathematics to meet graduation requirements. She was advised to get a tutor before entering the course. She did this, and, by having such assistance, she finished the course without undue difficulty and with a semester grade of C. Without the tutor she would have had to work much harder; she would probably not have made a grade above D; and she might easily have failed the course.

It is not unusual for students to obtain tutors after they have encountered serious difficulties in courses and are already seriously in arrears in their work. The better plan obviously is to avoid such unfortunate situations by taking suitable preventive measures.

Recall.—In the case of material that is to be learned so that it can be used at some future time, it will be necessary to learn it so that it can be readily recalled; and the way to learn to recall is by practicing recall. At the end of a paragraph, or of a topic, or of

a chapter, the student should endeavor to recall what he has read, and then he should check to see that he is correct. Writing outlines from memory is another useful method of checking recall.

In some cases material is so easy to understand that practice in recalling it may seem unnecessary, but, if recall is not practiced, the impression may be so weak that, after a short time, recall will be impossible. Consequently even when material is very easy to understand, recall is generally advisable.

One gentleman who had an exceptionally good collection of funny stories which he used at social gatherings was asked to explain how he managed to know so many good stories. He explained somewhat as follows: When he heard a story the first time, he paid close attention to the details so that he would get the essential points clear. At the first opportunity he would mentally review the story; he would tell the story to the first person who was available to listen to it; and as soon as he returned to his study he wrote the story in a book that he kept for that purpose, and which was indexed for quick reference to any desired story. In this way he regularly recalled a story three times and also put it in writing so that he could review it later. His unusual collection of stories was thus due mainly to the fact that he worked at the job of collecting good stories, and, in doing this, he applied the principles of the psychology of learning. In the same way the student who would achieve an unusual mastery of academic materials will find it advisable to apply psychological principles.

Recall occurs through the use of some kind of associations, which may be either of a rational or of a non-rational type. When material has been organized in a meaningful way, the interrelationships of the parts will usually make recall easy. The chief difficulty usually occurs when associations are not meaningful. In this case some kind of cue will be needed for recall.

By repetition with the intent to remember we can usually establish associations between such items as: Columbus . . . theory that the earth is round . . . 1492 . . . discovery of America. If we succeed in connecting these items, when one of these is recalled it will tend to bring the others with it. Some people, however, do

meet abnormal difficulties with associations such as "Thirty days hath September, April, June and November," and so on. Others use quite artificial mnemonic systems. We have already indicated that aids of that type are usually to be avoided. Yet in extreme cases it is much better to use these techniques and to remember necessary items than it is to avoid the use of indirect cues, with the result that the desired material cannot be recalled. Consequently the student who finds it exceptionally difficult to recall certain types of associations is justified in resorting to mnemonic devices as far as may be actually economical in his case.

Overlearning.—Forgetting generally tends to follow learning, with the result that most material that is barely learned will soon be forgotten to such an extent that it cannot be recalled without assistance, and in that case it is consequently unlikely to be recalled when needed. One way to slow down the forgetting process is to continue practice beyond the point of ordinary learning, or in other words, to *overlearn*. Even with overlearning, forgetting will still tend to occur, but the greater the overlearning, the longer the time required to forget to the point at which recall is no longer possible. Also, when material is overlearned and is occasionally used thereafter, this use tends to fix the associations more thoroughly, with the result that the learning becomes relatively permanent.

There is, of course, the very practical question as to how much overlearning is profitable, because overlearning, like some other things, is subject to the law of diminishing returns. No general answer to this question is possible, but certain relevant principles may be stated. More overlearning is advisable for those who forget quickly; more is advisable for rote memory material than for more rational material; and more is advisable for material that is unlikely to be used immediately. However, the student will need to determine in each case the extent to which overlearning is likely to be worth while.

Review.—The effect of forgetting may, of course, also be overcome by review. Anything that has been learned and then forgotten beyond the point of recall can generally be relearned in less time

than was originally required, and with each new relearning, the material will become more and more firmly fixed and consequently will have a slower rate of forgetting.

On the same basis, if material is reviewed before it has been forgotten, the learning is more thoroughly established and forgetting will thereafter be at a slower rate.

In general, it is better to make the first review before very much forgetting has taken place, and this normally means that the first review should occur soon after the original learning. Later reviews may then be spaced at increasingly longer intervals.

In reviewing, it will often be advantageous for students to study in pairs, or even in larger groups, so that one may ask questions for the other, or others, to answer and so that appropriate topics may be discussed.

Aggressive Attitude.—Learning may occur when an individual is relatively passive, but it is generally most rapid when the learner takes an active and perhaps even an aggressive attitude. For this reason, students often learn most efficiently when they are preparing for a test or examination with a limited amount of time available. On the other hand, when there is no particular pressure, it is very easy to daydream and otherwise waste time.

Avoiding Excessive Fatigue.—In industrial work it has been found repeatedly that the greatest efficiency is obtained by the introduction of rest periods so that fatigue is reduced to a minimum. The same general principle holds for studying. When fatigue becomes too great, the individual tends to find that more and more effort is required to concentrate, errors tend to increase in frequency and in magnitude, and more time is required for a given amount of learning.

In general, the harder and the more fatiguing the work, the higher the percentage of the total time that it is advantageous to use for rest periods. In case of strenuous physical work, it will at times be profitable to spend more than half of the time in rest periods, though this will probably not often be true in intellectual work.

In reading, the eyes work very rapidly and are consequently subject to considerable fatigue. This may lead to headaches, and

these may interfere seriously with further mental work. For this reason it is desirable to plan study schedules so that long reading assignments can be broken up and the eyes rested while other work is done.

There is also what is known as postural fatigue. The human circulatory mechanism does not work with great efficiency when the individual remains inactive, as when seated at a desk, for a long period of time. Bending over a desk also tends to interfere with efficient breathing so that an oxygen deficiency develops, and this further reduces capacity for effective work. For the greatest efficiency, therefore, it is desirable that sedentary work be broken up by periods of physical activity which will restore normal circulation and breathing. Some brain workers make a practice of taking short rapid walks between study periods or of doing a few minutes of vigorous calisthenics to restore normal circulation. In addition to such short periods of exercise, there should, of course, be longer periods which will keep the body mechanism in good working order.

Stopping Points.—Mental work will be more efficient if breaks in work occur at the ends of natural work units. As far as is practicable, the rest periods and breaks in work should come when some part of the total task has been finished. This is, of course, the opposite of the practice generally followed in the publication of serial stories. In these, the installment tends to end just as the hero or the heroine gets into some critical situation from which no escape is apparent. Then instead of being able to read on at once to a solution, the reader's imagination is left in a state of suspense. This may be good business for the publishers—at least they seem to think so—but it is very definitely not good mental hygiene and is not to be recommended as a model to be imitated in studying. A particular problem should be solved, if practicable, before it is left, so that the learner may relax, and so that he may give his undivided attention to the next problem instead of continuing to think about the problem left unsolved.

Taking Notes.—Students will very often need to take notes on lectures, library readings, laboratory work, field trips, and other

special exercises. In general, these should not be very detailed, though there will be exceptions for all students, and, for students with poor memories, more details will be advisable than for others.

The first objective of the student should be to understand a lecture, library reading, or laboratory experiment. Then the essential facts and principles should be recorded, and this record should usually be in complete statements. Otherwise the student will be likely to find after his notes are "cold" that various items are practically meaningless. The emphasis should, of course, be on the more important points, but since details are likely to be most easily forgotten, any essential details should be included in the record.

In laboratory work, it may be desirable to make sketches of apparatus and drawings of things observed, as in biology, so that these will be available for review and for writing up laboratory notes.

The lecture and library notes of some students are both too detailed and too nearly exact quotations. According to campus gossip at a leading university, a student took an essay test on a lecture course and answered questions practically by quoting the lectures verbatim. When the paper was returned, the industrious student was shocked to find this notation: "Grade, O. This is parrot work. Show that you have a brain." Perhaps this did not really happen, but, in any case, it involves an important principle: it is generally better for the student to state ideas in his own words, because he can then be more certain that he understands what he is writing.

Some students follow the practice of taking rather brief notes during lectures and then writing these notes out more fully as soon as possible after the lecture. This is an excellent thing to do, because it requires the immediate recall of the material and permits a fuller statement than is usually feasible during the lecture. It also permits typing the final notes so that they will be in much better form for later review.

Writing Papers.—Papers written by students may be in a great variety of forms, such as short stories, summaries of published articles, and reports of scientific research. Procedures will neces-

sarily vary, therefore, according to the nature of the paper. In the present discussion, however, we shall limit ourselves to processes involved in writing a typical paper which involves a digest and reorganization of several published discussions of a topic.

One of the first steps in writing a paper is usually the compilation of a bibliography. If a recent treatment of the topic is available, this will usually give references to other books and papers on the subject. By consulting these, other references can be located. In addition, the student should consult such indexes as the *Readers' Guide to Periodical Literature* and the indexes in special fields, such as *The Education Index* and the *Psychological Abstracts*. Most libraries have subject indexes, and these will frequently furnish additional references, though these are usually limited mostly to books.

The next step normally is to read as many of these references as time and circumstances will permit, and to take suitable notes. At this stage, rather wide reading is to be recommended.

Together with the reading, it is desirable, if possible, to discuss the problem with others who are familiar with it. Such discussion is normally a great aid in clarifying ideas and in suggesting new leads.

After most of the material has been collected, it should be organized into some kind of logical or psychological sequence. This should give an outline which is to be filled out by the actual writing.

In the writing itself, most experienced writers prefer to write rapidly a first draft, and then to revise, and continue to revise, until a satisfactory product is secured. Certainly very few are able to write at their best level without considerable revision. Some who write the original copy on a typewriter follow the practice of using triple spacing so as to have plenty of room for revision.

The process of revision may be even more effective if several days intervene between the writing of the original draft and the final revision, for the reason that ideas require time for incubation and development. Even after a paper has been supposedly completed, new ideas on the subject may be developed which will make the paper much better if they can be included.

As a final practical measure, the paper should be typed if possible; otherwise it should be neatly written in ink. It has been shown experimentally that teachers tend to give higher marks to papers that are neat and legible than to papers that have a poor appearance and are hard to read. In other words, the teacher tends to form something of a total Gestalt or judgment of the paper, and, if its appearance is poor, that will be a factor in lowering the grade.

Final Examinations.—Preparation for final examinations is valuable to the student in that it involves a very useful comprehensive review of the entire course, and, in addition, it gives an opportunity to see the subject as a whole and to organize it and work out relationships between parts much more effectively than could have been done earlier.

The final review will be much easier if the student has done a good job of underlining his text and has kept clear and well-organized notes. It will then be possible to review the most important points in a text without the necessity of reading all of it.

Meanings, relationships, applications, and organization should generally receive the primary emphasis although preparation for objective tests may require greater attention to the learning of factual details. Even in the latter case, however, it is easier to remember details if the subject is well understood and organized.

The final part of a review may well be done with other students, so that questions can be raised and discussed. The assistance of tutors will also be of great value to many students at this time.

In taking objective tests with time limits, the student should work rapidly and answer all questions that he is able to answer readily. He should then return to the harder items and answer as many as time permits. It is desirable for students to know whether the score is simply the number right or whether a correction is made for guessing. In the former case, an answer may be given to all questions, but, in the latter case, especially if the test is of the true-false variety, guessing may be hazardous when the student does not see the point of a statement. The common practice of scoring true-false tests by subtracting the number wrong from the number answered correctly will result, in some individual cases,

in serious errors, and for that reason some students will make better scores if they do not guess, though it is, of course, also true that some students will make better scores if they guess. On ordinary multiple choice tests with three or more choices, guessing is ordinarily a safer practice even if corrections are made for guessing.

From practical experience the writer has learned that some students, particularly some women, have a special difficulty with true-false tests. They may be able to write good essay examinations, but almost invariably make considerably lower grades when confronted with true-false tests. The reason for this is not entirely clear, but, in a number of these cases, further training and experience have resulted in a very marked improvement. The teacher can assist here by giving training in the interpretation of such test items.

When writing essay examinations, it is well to prepare a preliminary outline so that the answers will be well organized. Different instructors will have different tastes, but the writer has urged students to write essay answers as if they expected the answers to be read and graded by people who were reading for information, and who consequently would rate the paper on the basis of clearness of exposition. Too many examination papers require the reader to read between the lines, and, consequently, could not be understood by a person who did not already have a better understanding of the subject than is shown by such writers.

Finally, as was pointed out in connection with the writing of papers, neat and legibly written papers with correct spelling tend to receive higher grades than those that are not easy to read or are unattractive in appearance. For this reason the student is advised to write final examinations with blue or black ink rather than with colored inks or pencils. In case of the poorly written paper, the Gestalt principle that the whole is more than the sum of its parts may be incorrect: the whole grade attached to a paper may turn out to be a grade based on the sum of the good qualities *minus* a deduction based on the sum of the deficiencies. It is essential, therefore, to avoid unnecessary deficiencies as well as to make positive contributions. When the deficiencies are very obvious and serious,

the algebraic sum arrived at by the grader is likely to be *less* than it should be.

QUESTIONS AND EXERCISES

1. Why is it important to train students in methods of studying?
2. What factors other than methods of studying help to determine the results obtained?
3. What are some of the ways in which the teacher may encourage the use of better methods of studying?
4. How is physical hygiene related to efficiency in studying?
5. Describe a good procedure for the reluctant student to follow in beginning to study.
6. How may a student improve his motivation in a subject in which he is not sufficiently interested?
7. Why is it desirable to review a previous assignment before beginning to study a new one?
8. How should the study methods of "slow" students differ from those of superior students?
9. Why is it important to pay particular attention to new words?
10. Describe a good system to use in underlining.
11. Why is it desirable to use a text that has not already been underlined by another student?
12. Why is it important to practice recall while studying?
13. What is meant by "overlearning"? Why is it important?
14. When is it desirable for a student to have a tutor?
15. How should a student proceed when taking an objective test with a time limit? What should he do about guessing?

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CHAPTER 14

MENTAL HYGIENE IN EDUCATION

One of the most significant aspects of contemporary educational theory is its emphasis on the training of the whole personality rather than simply the training of the intellect. Desirable personality development is stressed, and this necessarily involves consideration of the adjustment of the individual to his environment. In connection with the problem of adjustment the question of mental hygiene demands consideration. Poor personalities and poor adjustment are both characterized by poor mental hygiene, whereas the best personalities and the best adjustments reflect a positive application of the principles of mental hygiene. For this reason some familiarity with these principles and their applications is necessary for the most effective teaching and learning.

Mental hygiene is all the more important because we seem at the present time to be in a period when mental difficulties are increasing. This trend may be indicated by a quotation from Menninger,¹⁸ (pp. 644 f):

... half our hospital beds in America are devoted to mental illness. That fact is often amazing to laymen. Statistically, about 50 per cent of all patients who go to doctors have emotional problems. These are expressed not only in attitudes and behavior, but in physical symptoms—in the heart, the limbs, the stomach, or the aching back. There are many, many evidences that we live in a sick world. We have hit an all time record of crime which is costing us about ten billion dollars a year in this country. We have an increasing amount of delinquency in every community in the country. We know that our divorces have doubled inside of six years—whatever that means. If we are going to face unpleasant and disagreeable facts, many Americans make other Americans extremely unhappy by discriminative and prejudicial practices.

The mental hygiene movement is relatively recent, having originated early in the present century. *A Mind That Found Itself* by Beers, published in 1908, is one of the first important contributions. This book, as the title indicates, is an account of the recovery of normal mental balance by a person who had experienced mental difficulties. Dr. William H. Burnham, the author of *The Normal Mind* (1924), of *The Wholesome Personality* (1932), and of numerous special articles, has done more probably than any other one man to lay the scientific foundation of the mental hygiene movement in education. At the present time, however, mental hygiene is sometimes considered to be more of an art than a science, and there is no question that both art and science are necessary for dealing successfully with the problems involved.

It is common practice to urge the importance of mental hygiene by pointing to the larger number of individuals who are committed to our mental hospitals and to the large numbers who do not get into such an institution but who suffer nervous breakdowns or give other indications of nervous difficulties. In World War I, many soldiers were listed as suffering from "shell shock," and various theories and treatments were devised. In World War II, a special effort was made to exclude potential nervous cases from the armed forces, but in spite of this precaution, the number of cases suffering from "battle fatigue" and related ailments was much greater than ever before. Many of these nervous casualties have been more or less permanently damaged mentally by their war experiences.

Mental casualties both in time of peace and in time of war afford us examples of what happens when conditions are sufficiently bad; but a consideration of such cases may be misleading in that it may cause us to think that mental hygiene is concerned simply with mental pathology. This is not the case. The real importance of the movement is to be found in the fact that it points the way to the most effective and happiest living for everybody. For this reason mental hygiene is fundamental for effective teaching and learning. Also the development of proper conditions of living, and the training of people along this line, are the best preventives of the occurrence of "mental difficulties"; and, of course, prevention is much more desirable than cure.

(FACTORS IN MENTAL HYGIENE

The Multiple Factor Theory.—Some theorists have attempted to explain practically all cases of mental difficulties by a single cause or by a single group of related causes. More careful students do not subscribe to such simple explanations. Rather they point out that all behavior has complex causes and that most cases of serious mental difficulties result from the combined effects of a number of disturbing factors. No one factor can properly be said to be *the* cause of the trouble, although the elimination of any one of several factors may, in individual cases, be sufficient to enable the individual to cope with the situation. In World War II, soldiers endured all manner of hardships, including hunger, loss of sleep, and prolonged nerve strain, without becoming mental cases; but when malaria was added to these, some of the soldiers broke. They might have surmounted the other difficulties, or they might have stood the malaria under normal conditions, but the combination was too much. For this reason the prevention of bad mental hygiene requires attention to the total environment; and the treatment of cases resulting from bad conditions or a set of bad conditions may require a variety of changes in the life of the person concerned. In fact, if it were possible, it would at times even involve supplying the individual with a new set of ancestors and a new past history.

Heredity and Environment.—Students of heredity agree that body structure, and hence function, depend in large measure on heredity. There is also good reason for holding that as a result of the mechanism of heredity, individuals vary greatly in their capacity to resist possible unfortunate mental effects of environmental hazards. These original differences are further modified by experience and training so that some individuals become hardened and inured to misfortunes and disappointments while others are overtaxed and consequently become less able to meet new difficulties. As a result of these forces, the variability in the capacity of different individuals to resist environmental pressures and frustrations is probably similar to the variability of other psychological traits.

On logical grounds it is also probable that environmental pressures on individuals vary more or less as a normal curve. Some

unfortunate people suffer a series of adversities. Some people, in contrast, have few serious problems to meet: they have good health, economic security, nice friends, congenial family relations, and their time is spent with agreeable activities, occupational or otherwise.

Under these conditions, difficulties in mental hygiene do not result simply from heredity or from environment, but rather from the balance between the two. At any given time, each individual may be thought of as being like a steel wire in that he has a certain breaking strength. He can carry a certain load, and if the load is not too great, he carries it without damage; but if the load is increased beyond a certain point, he will break under the strain. On this basis an individual with little capacity for resisting strain may get along very well if he is able to keep clear of too much trouble, whereas another individual with great capacity for resisting strain may attempt too much, through circumstances or through bad judgment, and may overtax his capacity for resistance. The study of mental hygiene should help meet this difficulty in three ways: (1) by teaching the individual how to avoid some problems; (2) by assisting him to reduce the number and degree of the difficulties he already has; and (3) by increasing his capacity for enduring conditions of stress, or, in technical parlance, by increasing his frustration tolerance.)

The eugenics movement attempts to bring about racial improvement by reducing the number of births from the unfit part of the population and by increasing the number from the fit group. On the environmental side, it is important to improve social and economic conditions so that there will be less unnecessary stress on the population, but, as a matter of fact, the general tendency of civilization seems to be to increase the difficulties of adjustment rather than to decrease them.

Physical Factors.—The ideal of a sound mind in a sound body is still a good one. There are a number of ways in which bodily conditions may affect mental hygiene.) In the chapter on motor learning, in connection with the discussion of stammering, it has been pointed out that malnutrition is held to be one of the etiological factors. (More specifically a deficiency in protein assimila-

tion seems to result in nervous deficiency. This is logical since the proteins are the chief body-building foods. Furthermore, since a considerable part of our population is not economically in a position to purchase a really adequate diet, and since we have never had an adequate supply of dairy products, it is probable that malnutrition is partly responsible for our mental difficulties. Teachers are, of course, unable to change these conditions, but something may be done in individual cases through school lunches or otherwise.

The glands of internal secretion vary in efficiency, and these variations will include both over-function and under-function of such important endocrine glands as the thyroid and the pituitary. These may affect both the growth and the behavior of the children who are affected.

Hypothyroidism, or under-function of the thyroid gland, tends to retard general bodily and mental growth, and makes the child sluggish and unable to concentrate effectively. In extreme cases these children may become mental defectives and are then known as cretins. However, if such cases are diagnosed early enough, they can be helped greatly, and possibly cured, by the administration of thyroid extract.

Hyperthyroidism, or over-function of the thyroid, leads to over-activity, tension, and irritability. Such children tend to be thin and nervous and they are likely to attempt to do more than is good for them.

The most important service that the teacher can render in these and other glandular cases is to refer them to a competent physician for diagnosis and treatment.

Cotton⁴ has supported the idea that a major part of our mental difficulties are due to focal infections. These include especially infections of the teeth and tonsils. The theory is that these infections poison the system, and, if this continues for a long time, the nervous system may be weakened with the result that the individual is more likely to become involved in behavior difficulties. Such infections may very often be contributing factors in producing bad mental hygiene, but, as Terman and Almack²⁸ point out, defective teeth are very common in school children. They are so common, in fact, that

it is evident that good mental hygiene is possible in spite of the presence of such infections.

Here, again, the teacher may help by referring any suspected cases to competent specialists for diagnosis and treatment.

Functional Mental Difficulties.—The most popular interpretation of mental difficulties is in terms of some form of Freudian psychology or psychoanalysis. According to this view, mental difficulties usually result from conflicts between motives or between motives and the possibility of satisfying them. In many of these cases no effective solution or substitute is found; the unsatisfied tendency persists but tends to be suppressed and dissociated from the conscious personality.) In the most extreme cases this may result in multiple personalities, as in the famous case of Miss Beauchamp, who developed four different "selves."

(In some cases, the precipitating cause of the trouble is an emotional shock. Thus, in one case, a cat was pitched on a girl's back at night by a thoughtless and inconsiderate practical joker. The cat, not unnaturally, dug in with all of his sharp claws. Thereafter the girl, and later the woman, had a pathological attitude of fear and hostility for cats in general. \

The general psychoanalytic theory of conflict and suppression has led to conflicting interpretations and applications. One group has maintained that since inhibition, conflict, and suppression lead to mental difficulties, we should discourage inhibition. Let children be natural and express themselves. Up to a certain point, this recommendation is psychologically and otherwise sound.) Children need a considerable degree of freedom for the fullest degree of development. But there is a certain point at which this ceases to be true, and this point is reached when the freedom of the individual to express himself conflicts with the rights and welfare of others.

On this point we shall quote some comments by Frank ⁹ (p. 374):

The frequent cry against any repression of the child involves a confusion that is often tragic for the child. Every culture involves deprivations and repression, the patterning and regulation of physiological functions and human behavior, which, if wisely handled, are only redirections and modulations of impulses. . . .

These learned patterns and repressions are the chief factors in man's ability to go beyond a purely organic existence. It is not the ordering of life that damages the child, but the distortion, the fears, anxieties, and permanent frustrations and inhibitions that parental and educational practices unnecessarily inflict upon the child in the process of establishing these socially and individually necessary repressions.

(Since, from an emotional point of view, some of the most important parts of a child's environment lie outside of the school, the teacher will be confronted with mental hygiene problems that are not of her making but which may have a vital effect on work in school. Before these problems can be solved, attention may have to be given to the outside causes.) However, there are important things that the teacher and the school in general can do to avoid or reduce unnecessary conflicts and frustration. Some of these will be considered later in the chapter.

Jacobson's Theory of Relaxation.¹¹—All work uses up energy; consequently it is obvious that anyone might work too much and rest too little and so reach a point of exhaustion. Not only do our muscles and nerves work when we are walking or playing tennis or engaging in other overt activities, but at all times when we are awake there is a certain amount of muscular tension which is called *tonus*. When we are emotionally aroused or excited, this neuromuscular tension is increased, and this means that the rate at which energy is used up is also increased. Hence any prolonged emotional excitement is exhausting. When emotional drives are not satisfied, or when they are not permitted a normal outlet, they tend to persist. We use the term *perseveration* for this tendency for unsatisfied drives to continue to keep the organism in a state of tension. This is one of the major reasons why conflicts, if long continued, are so injurious physically and mentally.)

(But tensions are also built up in ordinary everyday life where there are no really serious emotional problems but where conditions tend to place the individual under an undue amount of pressure. In any job that requires concentration, or close attention to detail, or considerable speed, or too much responsibility, the individual may work under an excessive load of tension.)

Whatever the causes of the tension, Jacobson proposes to relieve the difficulty by teaching the individual to relax. Not only is he to be taught to relax in general, but he is to learn differential relaxation in which the body as a whole is relaxed except for those muscles that are required to do the job. Thus the person who is writing with his right hand may almost entirely relax the left hand and the other muscles of the body except those needed to maintain posture and to do the writing. Furthermore, the writing hand may be tense only to the degree needed to write efficiently; that is, no unnecessary energy may be used even in the reacting muscles.

Emotional activities are associated with stimulation of visceral organs and muscles. These react reflexly in case of emotional stimulation and are not directly under voluntary control. As a result we are not able directly and voluntarily to relax visceral tensions. But Jacobson has found that visceral tensions respond to relaxation of voluntary muscles. If, therefore, the angry man relaxes his jaws, facial muscles, hands, arms, legs, and trunk muscles, the relaxation tends to spread to the visceral muscles as well, and presently the major part of the tension associated with anger is gone. Since some additional adrenin is usually secreted when anger is first aroused, it may take some time for the anger effect to wear off entirely, but fairly complete body relaxation will greatly reduce the anger effect and will reduce the amount of adrenin entering the blood stream. For this reason, relaxation is a most important means for the general conservation of energy and for emotional control.

Learning to relax involves learning to shift from a condition of tension to one of relaxation. The learner is taught to tense voluntarily a part of the body, such as the hand or the arm, and then to let go and relax it. This practice is continued until it is possible at will to relax any part of the body. After this differential control has been acquired, it is then possible to relax parts of the body while working, to relax more completely during rest periods, and to reduce the bad effects of emotional tension.

(This principle has various applications to teaching, such as the elimination of unnecessary emotional tension and excitement, the provision of rest periods, and the alternation of activities so as to

keep fatigue to a minimum. Too much relaxation in children is not conducive to learning, but too much tension is detrimental to the physical and mental welfare of all concerned.

Psychoanalysts are prone to think that all cases of hypertension are due fundamentally to emotional conflicts, but in many cases of overwork the hypertension is a matter of simple mechanics: the weakness resulting from physiological exhaustion requires increased effort, which involves increased tension, in order to continue to perform at the required level. It is largely for this reason that many physicians and nurses require the use of stimulants. There are times when they are forced to work excessively long hours under conditions that tax to the utmost their powers of endurance; consequently they resort to some stimulant—which they have conveniently at hand—in order to meet the emergency. The high school or college student may also feel around examination time that he confronts a serious emergency and he may work and lose sleep to the point of exhaustion. One of the writer's students, who gave no evidence whatever of any profound emotional disturbance, overworked during a final examination period and collapsed during the last examination. Some cases of this kind are due to procrastination, some are due to excessive assignments, and some are due to excessive ambition on the part of comparatively weak students who want high grades, or whose parents demand that they get high grades.

One of the worst ways in which "good" teachers may contribute to unnecessary pupil tension is by making assignments that are too long so that late study hours are encouraged. This leads to loss of sleep and to general physical and mental fatigue, and when the fatigued individual is in a situation where work must be continued, he must build up more and more tension to do the job. In contrast, the person with an adequate energy reserve is able to do his work without developing excessive tension.

(**Recreation and Play.**—Prolonged and excessive use of one set of muscles is more fatiguing than the same amount of work done by varied groups of muscles. For this reason a shift in activities tends to relieve fatigue. The mental worker, for example, is helped by shifting to physical activity. The physical activity is work and

uses up energy, but the nerves used in the regular mental work are in large measure left inactive and permitted to recover.

Recreation and play also have other benefits. If the activity is physical in character—and mental workers should regularly engage in some form of physical recreation or work—it stimulates general body activity and so assists respiration, circulation, digestion, and elimination. It helps to build up a blood stream of suitable character to supply to the nervous system the nutrition and the oxygen necessary for all activity. High thinking is certainly rather less likely to occur in a body that is enfeebled and in a toxic condition.

Sports and recreational activities also tend to add to the zest for living. Many people in this machine age are not too infatuated with the piece-work jobs that they do to earn their pay checks. For this reason an interest in some sport or avocational interest, such as music, may do a great deal to make life, in general, interesting.

Much work requires isolation and concentration on the individual task, but sports and recreational activities may have and often do have an important social aspect. This makes it possible for the worker to combine much-needed physical activities with agreeable social contacts. Golf is recognized to be more than merely a game of physical skill in which a man goes out and takes a number of swings at a ball and walks for a few miles. Consequently the game is played typically in foursomes; and next to the golf course stands the club house—the Country Club—to which members and their families go for cards, for dinners, for dances, and for other social diversions. Some clubs even add riding, fishing, boating, bathing, tennis, and other forms of sport and recreation. Some of these golf courses are very beautiful and make an artistic appeal, while some are very difficult and thus provide a lifetime challenge even to the experts. Such clubs, in short, attempt to provide a complete answer to the problem of play and recreation.

Balanced Stimulation and Response.—Burnham⁸ formulated a fundamental principle of mental hygiene in terms of stimulation and response. Normal development requires normal stimulation and response, and undesirable mental hygiene may result either from understimulation or overstimulation or from underresponse or over-

response. We shall consider each of these separately, but, in practice, of course, some degree of stimulation always goes with some degree of response. Consequently we may have overstimulation followed by overresponse, normal response, or underresponse; and similarly, understimulation or normal stimulation may be followed by various degrees of response. Some individuals may show a rather stable pattern with reference to this balance between stimulation and response, while others may vary greatly in that respect from time to time.

Understimulation.—All responses start with some kind of stimulation; and mental growth and development require both stimulation and response. For this reason the amount and variety of stimulation received constitute an important factor in development.)

Cases have been reported of children who have developed without normal human contacts. One of these was the wild boy of Aveyron. He was found living like an animal and at the time was apparently about six years old. He could not talk and also failed to give other evidence of human training. His gait was like that of an animal on all fours, and he showed little evidence of intelligence. He came under the tutelage of Itard who spent some time trying to develop any capacity he might have, but the results were not too successful.

Cases of this kind are difficult to interpret because we do not know what the original capacity of the child was, how long he had lived under such conditions, what diseases he may have suffered, or anything else about his past that might have been significant with reference to his condition when found.

We do know, however, that all mental content comes through stimulation; for there are no innate ideas. We know further that, although there are important differences in capacity, the ability to use these capacities effectively depends on practice and on learned skills. For this reason, the child brought up in a barren environment cannot have a rich mental content. Nor can the natural human drives and dispositions be satisfied in an unstimulating environment.) It has been reported, for example, that women living on isolated ranches

and farms are more likely to go insane than are women living in a more normal social environment.

A practical example of the effects of isolation and absence of stimulation is found in the use of solitary confinement as a punishment for hardened criminals. Superficially one might think that it would be no great punishment to confine a man in a dark quiet room for two or three days on a bread and water diet. This is recognized, however, as one of the most severe punishments that can be used, and it has been charged that criminals have become insane as a result of solitary confinement.

Monotony and absence of stimulation are deadly. Boredom, whether in school or out, is a terrible affliction. Adults who are bored while listening to a speaker may go to sleep and find a temporary escape, but children are more likely to seek—and find—other outlets for their energy. For this reason we cannot expect to maintain satisfactory attention and learning conditions in school unless we present children with varied stimuli that appeal to their interests. This principle, entirely aside from educational considerations as such, is a basic condition of really good order in the schoolroom.

More important educationally is the fact that minds can grow only on the basis of stimulation and that all content must be received through experience. For this reason a child must have a rich experience if he is to have a normal and hygienic mental development.

It is in line with this principle that some of the most important changes have taken place in our kindergarten and early grades during the past generation. On one occasion a small boy in the first grade returned from school and was asked by his father, "Well, Don, what did you have in school today?" The reply was, "Nothing, Dad, except the same old rat." This incident, which dates back to about 1900, is in line with earlier curricular offerings, which at the first grade level were often based mostly on the content of a primer and first reader. This entailed much attention to "the same old rat" and to similar sources of pupil boredom. In contrast, the programs of the newer and better schools have been considerably enriched, although some schools have spent too much time on activities such as

cutting out paper dolls, which, after all, do not greatly enrich the child's mental content. What the child needs here is to learn at the concrete level a great deal about the real world in which he lives rather than about fairy tales. He needs to experience good music, to see good art, to learn the names and characteristics of common animals, and otherwise to enrich his experience. This is the sound program educationally and it is necessary, furthermore, for proper mental hygiene.

Overstimulation.—All of us have heard of the gentleman who reasoned that, if one dose of medicine was beneficial, several doses taken at once would be several times as beneficial. In this case, however, the chief beneficiary of the increased dosage was the undertaker. In life in general, and in education in particular, we have something of the same problem. Stimulation in proper amounts is necessary for proper development, but, beyond some optimum point, excessive stimulation is detrimental to development and to proper mental hygiene.

There are several reasons why overstimulation is bad. In the first place, overstimulation, and overresponse as well, causes fatigue. As a rather extreme example, it has been found that, if an animal is continuously stimulated with a single pitch for long periods of time, deafness for this pitch results and the nerves involved degenerate. A more familiar example is snow blindness. Snow reflects light to such a high degree that prolonged exposure to snow fields in bright sunlight overstimulates the eyes, and such extreme fatigue at times results in temporary blindness so that the sufferer needs to be placed in a dark room for several days to permit the overtaxed nerves in the eyes to recover.

Fatigue studies have shown that it is possible for a person to work effectively when surrounded by noise and distractions, but he uses up more energy to do so and fatigues more rapidly. It is obviously easier to concentrate when there are not so many distractions.

In the next place, overstimulation is bad because the most effective learning is impossible without time for assimilation. If after learning something, we immediately begin to study something else, the second body of associations interferes with the first and causes

them to be forgotten faster. This interference is known as retro-active inhibition. The person who has relatively few significant experiences remembers those clearly, while the person who experiences too much in too short a time is likely to get badly confused and to forget them more readily.

A related objection to overstimulation is based on the fact that reflective thinking and the meaningful organization of experience require time. It is impossible to grasp the varied implications of facts and generalizations without spending considerable time on them. To bombard the individual with too many different experiences is, therefore, not favorable to reflective thinking and assimilation. Speed is another important factor. Thinking is essentially a somewhat leisurely process. For this reason, when new facts and generalizations come in rapid sequence, it is quite impossible to grasp them or understand their implications. Furthermore, the material will have less transfer value and will be forgotten sooner.

We hear much in these days about integration. We endeavor to have integrated programs and curricula and we desire to help students develop integrated personalities. In many schools curricular organization and teaching procedures are planned to promote integration. Yet overstimulation promotes disintegration and there is a danger that we may overlook this fact and crowd our programs too much. There can be no question that, in some schools, too many subjects are required, school hours are too long for the kind of work required, assignments are too long, school marks are stressed too much, and in other ways the children are exposed to too much pressure. Under these conditions we not only have a curve of diminishing returns, but, beyond a certain point, we begin to lose what we have already gained. Sound mental hygiene in some of these cases requires a somewhat less ambitious program. The best mental growth is not promoted by the assembly line techniques of our modern factories. The possibilities of quantity production in the field of education are definitely limited by the laws of learning and of mental growth. This suggests that, although it may be generally beneficial to accelerate bright pupils in school, there is a definite possibility that acceleration may be overdone.)

Underresponse.—Complete learning requires stimulation, assimilation, and response. Some theorists stress the point that we learn what we do. Certainly the normal outcome of stimulation is response, and inhibition or suppression is necessary to prevent this outcome. We have already found in considering psychoanalysis that excessive inhibition and the lack of suitable outlets are conducive to bad mental hygiene. It is true that behavior must be inhibited and controlled, but, at the same time, it is necessary that suitable outlets be found and that response and reaction be considered an essential part of the learning process. For this reason the effectiveness of education is in part conditioned by the degree to which student responses are produced.)

(This neglect of response is one of the major weaknesses in our educational system. In spite of our published educational philosophies and of our claims, our primary educational effort has been directed toward the goal of getting students to acquire the maximum amount of knowledge. We might appropriately have set the sponge up as our leading academic idol before which the students would be expected to bow down and worship; for, in practice, those individuals with the greatest capacity for absorbing knowledge and with the greatest power of retaining this knowledge for a long period of time have received the highest honors. This fact has inevitably encouraged rote memory and has produced a considerable number of bookworms.

But such learning does not promote thorough understanding or transfer. For this reason it tends to lose contact with reality and to become futile. Furthermore, bookworms are not usually considered to have the most inviting personalities.

If education is to function most effectively in experience and is to produce effective personalities, it must be an education that emphasizes response. This statement is not to be understood to imply that education is mostly motor. An emotional reaction is a form of response. So is the process of thinking a problem through to its successful solution.) Answering a test is a form of response, and students who are tested frequently learn more effectively than those who do not have such experience. Laboratory work is another form

of response, and the student who has tested the application of a principle in a laboratory situation has a much better grasp of it than the student can have who has simply read it from a book.

From the mental hygiene point of view, one of the most important aspects of this problem has to do with the effect of response, or of the absence of response, on the individual concerned. Successful achievement is satisfying. Absence of achievement is demoralizing. Typically the student who solves a hard problem in mathematics is pleased with his success and feels stimulated to further effort. The student who does not make successful reactions is likely to feel that life is futile.)

Acquisition of knowledge is necessary: the student must to a considerable degree imitate the sponge. But the really important problem for the teacher is to get students to react, to feel, to do, to apply. It is futile to teach the rules of grammar and rhetoric if the acquisition of these does not lead to a better appreciation of the language used by others or to an improvement by the pupils in their own use of oral and written language. Mental hygiene theory and utilitarian common sense are agreed on this point.

(**Overresponse.**—Overresponse may take the form of too much activity in general or it may take the form of excessively violent responses in particular situations. Overstimulation, as discussed previously, is very likely to result in overresponse with its associated evils. (There is excellent reason for holding that hypertension may be one of the consequences of overactivity. Also, hypertension is one of the major evils of modern living in this country. As one minister put it, we set a fast pace throughout the day and arrive home thoroughly tired. But instead of settling down for a quiet and restful evening, we are prone to take a shot of "white mule" and go out to paint the town red until the small hours of the morning.

In part, overactivity is a result of too little inhibition. Some people talk too much; yet such people usually say very little. It would probably help if they reacted less. Some people race madly here and there apparently mainly for the satisfaction of being on the way. As one gentleman put it, they are in a hurry to get there so that they can hurry back again. In general, the most effective action

requires some degree of planning and deliberation, so that the person who is constantly reacting is not likely to be highly effective.

Overresponse also occurs as a result of long continued inhibition associated with a summation of stimuli which finally culminates in some kind of explosion. Thus a case was reported in the daily press in which a man shot a woman living in an apartment next to his because he could no longer stand to hear the "clack, clack" of her high heels as she walked. Granting that such a noise might be somewhat irritating to some people, it is evident that the murder became possible only through an initial suppression of response which built the reaction tendency up to the point of the explosion. In such cases a violent, final overresponse is to be prevented by providing some earlier outlet to response tendencies.

Humor.—A popular lecturer of a generation ago gave a lecture on "Humor and Sanity." The general idea presented was that humor is a most important safety valve: it keeps us from taking ourselves or the world in general too seriously and provides a useful outlet for pent up tensions. Also, laughter is a strong socializing force: when a group laughs together, this tends to unify them socially. Public speakers make use of this idea when they tell funny stories. Hence since bad mental hygiene is particularly associated with ego-centric points of view and with hypertension (and with depression as well), it is evident that laughing is one antidote for bad mental hygiene. For this reason the teacher who introduces a reasonable amount of humor into the schoolroom is a better teacher, although this suggestion is not to be understood to mean that the teacher is to assume the role of a vaudeville performer.

In passing, and for the sake of a more complete understanding of mental hygiene, it may be noted that crying also operates to relieve tension and thus to promote mental hygiene. The young widow who cries freely when her husband passes is more likely to return soon to a normal outlook on life than is the one who suppresses her sorrow. However, crying has, we hope, rather less application to schoolroom situations.

Psychological Needs.—As we have already pointed out, mental hygiene is concerned with the total individual and with the adjust-

ment of this total individual to his total environment, but there are certain needs that are particularly related to the school situation and it is with some of those that we are especially concerned here. Among these are the need for security, for success, for a feeling of personal worth, for engaging in worth-while work, for mastery, and for congenial associates.

Probably special attention should be given to the need for a feeling of personal worth. Snygg and Combs²⁴ hold that one of the most important factors in voluntary behavior is the effort on the part of the individual to enhance or at least to preserve his self-esteem. All activities tend to be judged in relation to this goal, and the child's adjustment in school will depend on the relation of the school environment and activities to his self-enhancement.

It is consequently most important that he have a secure position in his relationships to the teacher and to his social group.)

Our best schools and our best teachers have succeeded rather well in satisfying these needs, whereas our worst schools and teachers have failed to such a degree that they have driven millions of children out of the schools prematurely, and, in a few extreme cases, have been instrumental in driving children to suicide.

One approach to this problem is to find out why children like or dislike school, or why they like or dislike particular teachers. Without assuming that children's criticisms are always justified, or that their insights are perfect, we can learn a great deal by the use of this method about the merits and demerits of our schools.

(**Teachers.**—One of the most important factors in the mental hygiene of education is the teacher's personality and behavior. Here we should include especially her sense of fairness and justice, tact or lack of tact, sense of humor, teaching skill, the amount of work required, disciplinary practices and success, and marking system or lack of system. All of these, and many more of the teacher's characteristics and habits, are important in determining the general atmosphere of the schoolroom and the mental attitudes of the pupils.) Fortunately, however, all teachers who are willing to put forth the effort can improve their practices along these lines.

A special chapter is devoted to teachers, but some of the mental hygiene problems of teaching should be noted here. In the first place the pay of teachers in this country is often so far below that of comparatively unskilled union laborers that competent men have been very largely driven from the public schools. Consequently the schools have been turned over to women teachers. Probably the majority of these younger women consider teaching as a purely temporary position to be held until they marry; while many of the older teachers who have not married, or who have married and been divorced, have a feeling of frustration which influences to some degree all of their work. The low salaries give to the women as well as to the men a feeling of economic insecurity.

The work of teaching requires a high degree of nerve tension with little opportunity for relaxation. The inevitable papers and preparation for the next day's work lengthen the teacher's working day, thus leaving the teacher little time for relaxation. In addition, the teacher tends to be hedged about with social restrictions on behavior which do not contribute to relaxation. Teachers, like ministers and priests, are expected to be examples of discreet behavior.

Under these conditions it will be helpful if the teacher will face his or her difficulties frankly and take steps to counteract the difficulties inherent in the teaching situation and in the teacher's position in the community.

Mason¹⁴ notes that teachers who finally land in institutions for mental cases have generally had no hobbies. The moral of this seems clear: regardless of the demands made by the school and the community, the teacher should make it a point to leave some time for outside activities even if this means neglect of school work. The teacher needs physical exercise, mental interests outside of the school, and social participation in community activities.

Terman,²⁷ in an excellent treatment of these problems, stresses greater participation by teachers in community activities. The teacher needs friends who are not engaged in education. Yet the teacher who is already suffering from overtaxed nerves may naturally avoid such social participation. The answer to this must then

be found in lightening the teacher's load. This means fewer hours and smaller classes.

One specific recommendation Terman makes is that troublesome pupils be segregated. One or two troublesome pupils can disrupt an entire class and wreck a teacher's nerves. By collecting these bad cases under a specially selected teacher the rest of the teaching fraternity can be saved a great deal of tension, and the classroom can be more nearly what it is supposed to be.

Terman further points out that administrative officers are frequently brutal in their methods of dealing with teachers and that teachers are frequently brutal in dealing with children. Brutality begets brutality. Merideth¹⁷ makes some suggestions that bear on this point. In an article entitled "Administrative procedures that improve the morale and mental health of teachers" he makes a number of suggestions which may also be applied to a considerable degree to the improvement of relations between the teacher and her pupils. Merideth's suggestions may be reduced essentially to three: (1) More precise definition of functions and responsibilities, (2) more democratic administration and control of schools with greater participation on the part of the teachers in the determination of policies and procedures, and (3) a just salary schedule. All of these apply in principle to teacher-pupil relationships as well as to administrator-teacher relationships.

It is important that the teacher define precisely just what is expected of a class and that this be done well in advance so that time will be available for the performance. It happens much too often that teachers think they have told a class about an assignment when they have not done so. Also it will be helpful if the teacher will tell the class some of the more important things to look for in studying the assignment.

The second principle, that of democracy, is being applied more in modern schools, and, within limits, is a good step. It may, of course, be overdone. In view of the immaturity of pupils, there are distinct limits to the extent to which we may wisely leave educational policies to their decision.

The third principle, that of a just salary schedule, also applies to teacher-pupil relationships at least in the important matter of marks. Grades and marks are in a sense the pay the pupils get for their work. It is true that marking is at best a difficult and inaccurate business, but it is one of the important professional tasks of the teacher and should be done objectively and with all the professional skill at the teacher's command. This is one of the most troublesome points in teacher-pupil relationships and should be treated accordingly.

FURTHER PRACTICAL APPLICATIONS

(Most aspects of the educational system have their mental hygiene phases. A few of these will be indicated, but the treatment here is intended to be only a suggestion as to the possibilities.)

(The location of a school is an important item. Nearness to railroads and to streetcar tracks can be a serious disturbing factor.) One school drawing most of its students from a particular city was located eight miles from the city. This meant a considerable waste of time, energy, and expense—not to mention traffic hazards—for the students, who daily traveled that distance. In another case, a school was located on a high hill, and later a part of the school was located on an adjacent hill. Students trying to get from one hill to the other in the ten minutes between classes arrived at the second class out of breath and not in condition to work effectively for the next ten or fifteen minutes. One student who attended summer school at this campus, after sweating his way up the hill, expressed a very impious wish with reference to the future destiny of those responsible for placing the buildings on the hill. Obviously, convenience and quiet should be important considerations in locating schools.

(Curricular content may be important from the mental hygiene point of view in several ways. The educational system is at times too conservative and does not keep up to date. When this occurs, it should not be surprising that the students realize the obsolescence of the material and are unwilling to study it. We then have a bad situation from the viewpoint of mental hygiene.) We need constantly

to be on the alert to eliminate deadwood and useless facts from the content that we expect students to master.

Even if the curricular material is in itself satisfactory, it needs to be adapted to the students. This implies that there should be neither too much nor too little and that it should be placed at the proper grade level from the standpoint of difficulty.) The eighth grade at various times and in various schools has included formal grammar, commercial arithmetic, civics, and algebra—none of which were well suited to children of this level of mental development. Small wonder that at one time half of the children in the eighth grade did not go on to the ninth!

(Even with a good curriculum, we need also to have a suitable classification of students and suitable student guidance. This is necessary to get the students into the courses that are suited to their needs.) In some cases they will need to take work that is very difficult for them and in such cases they may need special help in order to attain satisfactory mastery of the material.

Teaching procedures and methods have a great deal to do with the question as to whether a course is desirable or not from the mental hygiene point of view.)

It is most important that students develop interest in a subject. They need to see its value in relation to some of the interests and purposes that they had when they entered the course.) At the high school and college level, this may depend largely on the adviser who helps the students pick out a suitable program of courses, but, at all levels, it also depends on the teacher to point out the significance of the material taught.

(In most subjects, it is of primary importance that they be taught in such a manner as to facilitate a high degree of understanding and organization.) The students need to get a view of the subject as a whole and to see how the parts fit into the whole. This adds greatly to the students' insight, makes the material easier to retain, and makes the work as a whole much more satisfying.

(For best results the student must be able to see that he is making progress toward a mastery of the material, and in the end, he must be able to feel that he has attained a reasonable degree of mastery.)

All of us feel a thrill when we master a task, and the more difficult the task, the greater the thrill. Conversely, when we know that we have not mastered anything we set out to master or were supposed to master, the result is a state of dissatisfaction. Hence the principles of mental hygiene require that the tasks be suited to the individuals and that instruction and practice be carried to the point of satisfactory mastery.

This point of mastery has been stressed particularly by Morrison, and, for a variety of reasons, it needs to be stressed to a greater degree in all educational work. In this way we decrease the degree of forgetting and encourage greater transfer. Also we promote greater student satisfaction and have consequently a more hygienic result.

In subjects for which suitable objective tests are available, the students may plot individual learning curves that show the individual improvement in the mastery of the material. This is a powerful and very desirable stimulant. The student is competing against his previous record rather than against the work of students who may have much greater natural capacity.

When ordinary class marks are based on a normal distribution, the results in this respect are frequently bad. It happens frequently that students work harder and do better work and yet do not get any better grades for the simple reason that the class as a whole is working harder and is doing better work. Students at times become angry under these conditions and perhaps justifiably so. This is a valid and serious criticism of the common practice of basing grades on average class performance. Harder work and better mastery of the material may not, under such a system, result in better grades.

One teacher who followed in a general way the idea of the normal curve explained to the writer that he deliberately gave lower grades at the beginning of the year and gradually raised them during the year so that the members of his classes could feel that they were making progress. However, if this is not a general practice, and is not understood by the students, it tends to discourage the class at the beginning of the term. This difficulty seems to indicate the need for a dual marking system: one mark to indicate relative position in

the class, and another mark to indicate absolute progress toward mastery of the material. The latter mark is needed in the interests of mental hygiene.

Teaching method also has its social implications. Some procedures involve group activities, while others are essentially individualistic in character. The degree of participation in social enterprises influences the degree of development of self-centeredness and individual competitiveness; and we have evidence that too much self-centeredness is associated with bad mental hygiene. Social integration is important for good mental hygiene, and we cannot reasonably expect to get this without participation in social activities. Hence a too individualistic educational method is not conducive to the best mental hygiene.

In this problem, as in other things, however, a middle ground is likely to be best. Meltzer¹⁵ quotes Jaederhold as saying that too much socialization destroys individuality and some of the finest aspects of personality. Surely, society would lose a great deal if we succeeded in making each individual like every other individual. What we need, then, is to curb the extreme deviates: try to socialize the too individualistic child and try to develop a greater degree of individuality in the colorless conformist.

Finally, two suggestions already made need to be repeated for emphasis: follow democratic methods as far as circumstances and the maturity of the class permit, and make special provisions for the variant child. Exceptional cases require exceptional treatment, but the classroom teacher with a full quota of charges has neither the time, the temper nor the training in many cases to deal with these exceptions. A special room and a special teacher are needed.

QUESTIONS AND EXERCISES

1. Why is attention to mental health especially important at the present time?
2. What is meant by the multiple factor theory of mental hygiene?
3. List several school practices that are detrimental to mental health and suggest methods of correction.
4. How may disease affect mental health?
5. How may attitudes affect mental health?

6. How may physical hygiene affect mental health?
7. How may school training protect the future mental health of students?
8. What is the relation between emotional maturity and mental health?
9. How may school discipline affect the mental health of the pupils? Of the teacher?
10. What can be done to reduce the mental health problems associated with low marks?
11. How may Burnham's theory of mental hygiene in terms of the balance between stimulus and response be applied in education?
12. How may the teacher apply Jacobson's theory of relaxation?
13. How does the personality of the teacher affect the hygiene of the school room? What can be done to improve the mental hygiene of teachers?
14. From the standpoint of mental hygiene, what are the arguments for and against the segregation of troublesome pupils?
15. Why is a sense of humor favorable to mental hygiene? How may this be applied in the school room?

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CHAPTER 15

EXCEPTIONAL CHILDREN

Before the development of the psychology of individual differences most children were classified as "normal." Only a small number of the extremely defective, the delinquent, and the insane were considered to be actually "abnormal." However, with the development of modern mental measurements and statistical methods, there has been a tendency to shift to the opposite extreme and to consider the "normal child" to be an abstraction. No two children are exactly alike; and fairly marked physical and mental differences may be found even between twins who may be classed technically as "identical." From this point of view, all children are more or less "abnormal" in that they will be found to deviate in most measurements from the group average; and in at least a few measurements, most children will deviate rather far from the average.

These conclusions are based on three principles which have been stated in earlier chapters but will be briefly reviewed here.

1. When any biological or psychological characteristic is measured in a reasonably homogeneous group, a distribution similar to a normal curve is likely to be found, although some distributions are definitely skewed. If, therefore, "normal" be defined as "average," most of the measurements will be either above or below the norm.

2. Most correlations between different characteristics are positive, but they are never perfect. From this it follows that, even if a particular child measures at the group norm for one characteristic, he is not likely to be exactly average for a correlated characteristic; and when correlations are low, as they frequently are, very great differences will often be found between the strengths of two characteristics in the same child. As a result, it is not unusual to find a child who is superior in one characteristic and inferior in another.

James may, for example, be excellent in reading and poor in arithmetic.

3. Measurements of a large number of characteristics in a single individual, when converted to standard scores, will also tend to give a distribution similar to a normal curve. The average abilities of different individuals may vary markedly, but each individual will have his own average and most of his abilities will be either above or below his own "norm."

Because of this intra-individual variability, it will obviously not be possible to adjust educational programs to the needs of an individual if only his IQ, or mental age, or average achievement score is known. We must have a more detailed knowledge of his special strengths and weaknesses. It is largely for this reason that classification into sections on the basis of ability has not been notably successful. Even though the average ability in a group may be high, many of the individuals in the group will have some marked specialized weaknesses that will make them unable to do superior work along some lines. For best results, therefore, an analysis of individual abilities and needs is indicated even when groups have already been sectioned on the basis of general ability.

Since mental ages and IQ's do not tell us about more specialized abilities, it will be necessary to measure these specialized abilities and to make use of the results when we attempt to make special provisions for exceptional children. The question as to how far we are to go in making and recording such specialized tests is largely a practical matter; but a minimum program would seem to call for tests of the following functions: auditory and visual acuity; motor coordination; verbal, numerical, and spatial capacities, either in addition to or as a part of a test of general intelligence; achievement in the more important subject fields, such as reading, arithmetic, spelling and writing at the elementary school level; and English, mathematics, social science, and natural science at the high school level; plus tests of special abilities in music, art, and mechanical ability for individual pupils; and probably some kind of personality adjustment test, such as the group Rorschach or the Bell Adjust-

ment Inventory, in case a qualified teacher or psychologist is available to interpret the results.

These measurements will probably be most useful if recorded in the form of a profile chart so that non-statistically minded teachers will be able to see at a glance the implications of the results. There should also be a cumulative record which will show any changes or trends from grade to grade. This will give a more reliable indication of a particular child's capabilities than can usually be obtained by the administration of a single battery of tests. It will also help to locate temporary difficulties that may require special attention.

In addition, it is very desirable that all children who for any reason become special problems be referred to qualified school psychologists for examination and that medical examinations be given when indicated. These special examinations will at times point to conditions in the home or in other parts of the social environment as needing adjustment; and, for such investigations, the services of a social worker may be needed. In cities that can and will afford the cost, it is therefore desirable to have a diagnostic group which includes a psychologist, a physician, and a social worker to aid in locating and analyzing the special problems of exceptional children. When these are not available, the classroom teacher will perhaps be forced to make the best adjustment possible under the circumstances.

SOME TYPES OF DEFECTS

Each teacher should understand the fact that practically all abilities show wide variability in degree of development in a group of ordinary children, and that a few children are likely to be found who are very deficient in any ability that may be used in school work. If the task requires pitch discrimination, or muscular strength, or distance vision, or visual imagery, or motor dexterity, or rote memory, or capacity to learn the vocabulary of a foreign language, or ability to solve problems in arithmetic, or ability to make a particular form of social adjustment, or to accept reasonably the consequences of an instance of bad luck—regardless of the special nature of the

abilities or traits involved—a few pupils are likely to have an unusual amount of difficulty in doing what is expected of them.

The best teaching requires that a teacher be on the alert to locate these individuals who have special difficulties in an activity or unit or specialized task and that suitable adjustments be made. It must, however, be conceded that when classes are large and mass methods of instruction are used, it is unrealistic to expect teachers to give much attention to specialized individual difficulties.

Sensory Defects.—Variability in specialized abilities is very great, and this holds true for both visual and auditory acuity; and since school work depends very largely on these two senses, and since about half of a school population will be below the group average in any trait, it is evident that there will be many cases of sensory defect that may require some attention. Fortunately only a small percentage of children are either blind or deaf, but a much larger number do have deficiencies that interfere with school work.

Since both visual and auditory acuities seem to be approximately normally distributed, it is evident that statistics as to the number of cases of serious impairment in the schools are somewhat arbitrary in that they depend on the particular standard set for "serious" impairment. However, it is estimated that about 80 per cent of school children have reasonably adequate vision, and that about 19.75 per cent have defects that are correctable. The remaining one-fourth of one per cent (0.25) includes those who are blind (0.05 per cent) and those who have very poor vision that cannot be given adequate correction (0.20 per cent) ¹ (p. 29).

The eye mechanism changes with age and apparently also with use. Expert opinion seems to indicate that the eyes of average children are not mature enough for reading until about the age of six or seven years and, in many cases, as we might infer, maturation beyond the age of seven is needed before reading is attempted. Otherwise a child may fail in his school work largely because of a specialized visual defect.

With increasing age up to maturity, and perhaps also as a result of use, the percentage of cases of myopia (nearsightedness)

increases progressively. This change is much more severe in some children than in others, with the result that a few students, especially at the high school and college levels, become unable to see clearly except at a short distance and consequently may be unable to read what is written on a blackboard. In most of these cases the wearing of suitable glasses will correct most of the deficiency, but when myopia is not corrected, it at times becomes progressively worse and may lead to blindness.

Other children are unusually hyperopic (farsighted) and are unable to do close work without excessive eyestrain, although they may be able to see clearly at a distance, and, as a result, they may not be detected by a conventional test. In such cases glasses will be needed for ordinary reading.

Astigmatism is a third common type of eye defect in which a partial blurring of the visual field occurs for one or both eyes at all distances. When such defects are sufficiently severe, glasses should be worn habitually in order to reduce eyestrain.

In most of these cases, glasses will correct the difficulty to such a degree that the teacher will not need to make special allowances for the individuals concerned, but in a few cases it will be desirable to give special attention to seating, lighting, and to the length of reading assignments. Counselors should, of course, consider these and other defects when they help to plan students' programs and not permit a student with poor eyes to take too many courses that require extensive reading. When corrected vision in the better eye is between 20/70 and 20/200, it is recommended that children be enrolled in special sight-saving classes, and when corrected vision in the better eye is poorer than 20/200, enrollment in Braille classes is advised¹ (p. 41).

Serious auditory defects are reported to be somewhat less common than visual defects of the same degree¹ (p. 98); but, as a practical matter, defective hearing is likely to have more serious consequences than defective sight because auditory defects are less likely to be noticed and because mechanical hearing aids are much more expensive and are less likely to be used. The writer has encountered several cases in the schools of children who were totally deaf without

that fact being known to the teacher in charge. In the most extreme case, after a lecture to a group of teachers, an experienced teacher came up to ask advice about a pupil in the first grade. Tests of this pupil soon developed the fact that he was deaf. Largely because of this defect he was then spending his third year in the first grade, and, so far as could be learned, no teacher had discovered that he was deaf.

Hearing aids are expensive, unpopular at all ages, and are at times difficult to learn to use. For these reasons, children with poor hearing will require relatively more attention from classroom teachers. The more extreme cases should be placed in special schools or in special classes and taught to talk and to read lip movements. However, after such instruction, some children are able to make good adjustments in regular schools and are less handicapped than the blind. The writer has had several deaf college students in regular classes who did good work without much special consideration, and one of these was elected to Phi Beta Kappa.

Routine testing of all pupils is necessary to locate the cases of hearing difficulty who require special attention, and teachers should, of course, be informed about all pupils with a serious defect. In formal classes, such pupils can be seated at the front of the room, and since most of the deaf acquire skill in lip reading, the teacher can help by facing the pupils as far as is practicable when talking.

Motor Defects.—Normal variability in motor functions is relatively less than in sensory functions and there are consequently fewer cases of motor than of sensory difficulties, but there are about two or three children per thousand with serious orthopedic defects, and perhaps as many as twelve or fifteen per thousand with defects serious enough to deserve some consideration. Most of these defects are either present at birth or develop before the child enters school ¹ (pp. 143 f.).

Some orthopedic defects result from congenital deformities, some result from prenatal or postnatal injuries and accidents, and some result from postnatal infections such as infantile paralysis and tuberculosis. Better health education should help to reduce the number

of such defects; but the chief responsibility of the schools will be limited mostly to giving the best training possible to such handicapped children. In the most extreme cases this is best done in special institutions; in less extreme cases, special teachers may visit the homes and give individual instruction; in other cases, children may attend school and be placed in special classes; and when the defects are relatively mild, children may be placed in regular classes and may need little or no special attention from their teachers.

The average intelligence of crippled children is below normal; but the variability is great, and some are of superior intelligence¹ (pp. 146 f.). Social adjustment is often a problem because of the difficulty, or even the impossibility, of participating in sports with other children on equal terms. Also, other children frequently show little or no sympathy for orthopedic cases and this increases the difficulty. However, the alert teacher who is aware of the special needs of crippled children can do a great deal to help them to be successful in their activities and to become accepted members of their social groups.

Low Intelligence.—It is usually estimated that about 2 per cent of the population are feeble-minded; but since the distribution of intelligence is approximately normal, a large number of school children will be mentally retarded to such a degree that they will need special attention. A small proportion of the feeble-minded are in institutions, but the capacity of such institutions is so limited that most of the higher grade cases of feeble-mindedness must be provided for in the public schools. In California, for example, the present capacity of the state institutions for the feeble-minded is only about 5,000, while, on the basis of customary estimates, there would be about 200,000 cases in the state.

In addition to the children who are of low average intelligence, there are many others who are of average or even of superior intelligence who have specialized intellectual deficiencies which result in slow learning in special fields such as reading, or arithmetic, or algebra, or geometry, or spelling, or music, or art, or mechanical work. For this reason, most teachers are likely to find occasions

when it is desirable to make adaptations in curricular content and in teaching methods in order to get satisfactory results.

Mental age has usually been found to be an excellent index of immediate learning capacity though not of future development. This means that a child with an IQ of 75 and a mental age of 9 years will learn about as well as a child with an IQ of 150 and a mental age of 9 years. Woodrow³² has given an example of this in the case of the practice curves of normals and defectives in sorting geometric

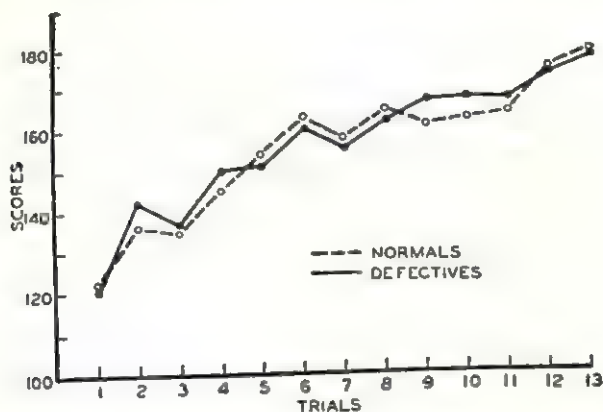


FIG. 34.—Practice curves for normal and for feeble-minded children on a geometrical form sorting test. The two groups had been equated for mental test ability. From Woodrow (32).

forms. When mental ages are equated, the learning curves are essentially the same. His results are shown in Figure 34.

The practical implication of this is that mentally retarded children can learn about as successfully as normal children if the tasks are adapted to their mental levels; but since their growth rates are slower than normal, they are not able to master the ordinary curriculum at the normal rate.

Children with low IQ's vary a great deal among themselves, but there are some average differences between the normal and the subnormal which may be of use in planning the work for such groups. The most important differences may be covered essentially by two statements: (1) subnormal children learn more slowly than the

normal; and (2) the subnormal have less capacity for understanding abstractions and generalizations.

With reference to the curriculum, these differences make it necessary that less material be covered in a given period of time and with less detail than is possible with brighter children. In the next place, more emphasis must be placed on the concrete and less on

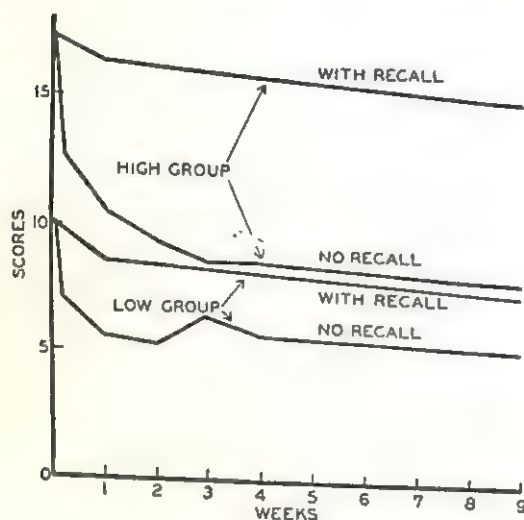


FIG. 35.—The effect of recall on rate of forgetting for groups of different levels of ability. Based on tests of separate groups of sixth grade children at different time intervals after the learning of geographic material. The high group is the top third, and the low group is the bottom third of the total group. From Spitzer (26).

verbal and abstract materials. The more difficult and more abstract subjects, such as grammar and algebra, are not suitable for students of low ability. Furthermore, in particular subjects, such as arithmetic and social science, the mentally slow should be limited to the simpler and more essential parts of the material.

In spite of their deficiencies, slow pupils can learn a great deal if assignments and teaching methods and procedures are adapted to actual learning capacity and rate.

Pupils often fail in ordinary courses because the rate of progress is too fast for them. The obvious remedy—when it is practicable—is to give shorter assignments, and to give more reviews, drills, and applications.

This difference in learning capacity is brought out very clearly in a study by Spitzer on forgetting.²⁶ Some material on geography was learned by groups of sixth grade children. This material was then relearned by different groups after different time intervals, which made it possible to plot the curve of forgetting that appears in Figure 35. Some groups had an additional recall of the material

immediately after it was learned, and separate forgetting curves have been shown for them.

The results were tabulated separately for the top and bottom thirds of the children, and from the figure it will be seen that, although recall helped both the high and the low groups, even with recall the low group did not equal the high group without recall. Although it is not shown in this figure, this experiment also showed that additional recall periods further reduced the amount of forgetting. Evidently, therefore, much more review is desirable for the low group.

Much more effort is normally required in order to provide adequate motivation for the subnormal because they more often fail to see that learning is important; and since they will find it necessary to put forth more effort to master a given unit of work, they will need stronger motivation. For this reason more individual counseling is needed, and class groups should be relatively small.

First-hand experience is more essential for the slow than for the normal. The vocabularies and the general understanding of language are poorer in children of low IQ. In fact, it is to be recalled that Terman found the vocabulary test to be the best single indicator of the IQ on the Stanford-Binet test. More emphasis should consequently be placed on teaching through experience, that is, through projects, films, television, still pictures, laboratory work, field trips, and other related audio-visual methods.

In this work, more care is necessary to be sure that children see what they are supposed to see. Much less can be taken for granted. Important features must be specifically pointed out and emphasized. More careful checks will be necessary to be sure that essentials have been grasped.

The methods of Progressive education are good for the subnormal in their emphasis on first-hand experience, but they are notably deficient with reference to repetition and drill. Progressive theory tends to hold that, when a child is properly motivated and is ready to learn a particular unit, drill should not be necessary; but, in practice, drill is especially necessary for slow learners, and the teacher will need greater skill in making this drill palatable and

effective. A film or a picture which needs to be shown only once or twice to normal children may need several repetitions for the subnormal. Also, slow children are more likely to forget what they seem to have learned, so that reviews distributed over a greater period of time are necessary for satisfactory results.

It is not possible to state on the basis of known facts and principles exactly how much review will be needed in particular cases. This can be determined only by making such further tests and reviews as may be necessary to maintain any desired standard of mastery.

Probably the greatest difficulty in teaching children with low IQ's is met in obtaining an understanding of abstractions, rules, and general principles. These will require much more explanation and many more examples and applications. Special attention to the meanings of words will be necessary; otherwise slow children will learn statements, rules, generalizations, and definitions by rote memory, and they may quote these accurately but with a minimum of understanding.

All of this adds up to the statement that the teacher of slow children will need to have a vast amount of patience, ingenuity, sympathy, and understanding, plus reasonable goals in order to achieve the results of which such individuals are actually capable. Under existing conditions, a considerable part of the unsatisfactory achievement that is found must be charged to deficiencies in the schools themselves: either the content we attempt to teach is inappropriate, or the methods used are not adapted to the capacities of slow learners.

Delinquents.—For reasons that are probably quite complex and not too well understood, delinquency has become a very serious social problem. It is also an educational problem because it has been found that delinquents usually show evidence of poor adjustment in school before they get into difficulties with the juvenile courts. In a survey of 1343 pre-delinquent school children in ten midwestern cities, by Williams,³¹ it was found that 97 per cent of the cases showed social maladjustment, 83 per cent showed school maladjustment, and 77 per cent showed home maladjustment³¹ (pp. 368 f.). The

school achievement of these children in relation to mental age is usually inferior, they generally read less than average children, and consequently their reading achievement scores are relatively poor. It is not, of course, to be assumed that the schools can correct all of the conditions that lead to delinquency, but it does appear that much may be done to reduce the degree of social and educational maladjustment, and, in so far as this can be done, it appears probable that delinquency itself can be reduced (Cf. 33).

About 80 per cent of the problem children are boys and 20 per cent girls, and these figures agree closely with the juvenile court records which show about 83 per cent of the cases are boys and 17 per cent girls⁸¹ (p. 366). Troublesome girls are probably slightly less likely to land in juvenile court than troublesome boys. In general agreement with other similar studies, Williams notes that physical overdevelopment in relation to chronological age is five times as frequent in girls as in boys. In many cases this is correlated with earlier sex maturation and is one of the causal factors responsible for delinquency.

The relatively low educational achievement of delinquents suggests the need for more attention to low achievers and for more effort to adjust curricula and methods to the needs and interests of children. This will require, as a preliminary step, more attention to educational and vocational counseling. If potential delinquents can be given reasonable and desirable vocational goals and can be shown that certain training is necessary in order to attain these goals, better effort in school and better achievement should result. However, this may very often require adjustments in school curricula in the direction of bringing about a closer adjustment to real life needs. Otherwise we should not be too much surprised when an adolescent refuses to put forth much effort to master difficult tasks that do not appear to him to be sufficiently worth while.

The fact that most of the delinquents have had difficulties in school adjustment might also raise a question as to whether the recent tendency toward automatic promotion may not have contributed indirectly at least to an increase in maladjustment. It has meant that pupils who have not mastered the material in one grade have

been promoted to the next grade where their difficulties would tend to be even greater. Failure is, of course, also an evil that is to be avoided, and for this reason if we are to solve the problem we must classify pupils and arrange curricula and methods so that pupils will be successful in what they undertake. Automatic promotion without mastery of material previously covered may simply be substituting one evil for another one.

On psychological grounds, delinquency is to be regarded as being due in large measure to the development of undesirable social attitudes, although these in turn are furthered by membership in undesirable social groups. The schools can do something in this area by giving more attention to the development of social attitudes in connection with the regular curriculum and by promoting suitable activities outside of school.

School dances and other social affairs given in the afternoon immediately after school can be used to provide desirable social recreation. A special effort can be made to bring about the inclusion of potential delinquents in extracurricular activities that will make for better social relationships. Clubs, such as Boy Scouts and Girl Scouts, can be promoted under good leadership. As discussed earlier in this text in connection with extracurricular activities, the schools have assisted in the development of summer camps, in the development of supervised playgrounds, and in obtaining vacation jobs. All of these measures tend to encourage better social integration and to reduce the probability of the formation of the vicious gangs that lead naturally to juvenile delinquency and to adult crime. On the whole, then, the schools may be able to reduce the probability that children will become delinquents.

Personality Disorders.—Delinquency and personality disorders are often related, but there are numerous cases of the latter without the former. Most of the more serious neuroses and psychoses do not develop until late adolescence or maturity, but less serious maladjustments are relatively common in school children. Also, psychoses such as epilepsy and schizophrenia do occur in adolescence.

Contemporary mental hygienists point out that some of the children who give no trouble in school because they are timid, retiring,

and conforming in their behavior are none the less seriously in need of assistance in the development of more desirable personalities. The average teacher may consequently expect to encounter a great many personality and behavior deviations that might be improved.

Because of the variety and complexity of these cases, suitable corrective measures will usually require a careful consideration of each individual; but the teacher should be on the lookout for undesirable personality traits and should make some effort to help such individuals develop a better adjustment. Timid children should be encouraged to participate more in group activities and discussions, while some of the more aggressive individuals will need tactful repression. Group discussion of desirable and undesirable personality traits may also be helpful.

Timidity and withdrawing are often due, in part at least, to a lack of certain skills, and this deficiency may be largely corrected by training. The girl who is a poor dancer, or a poor conversationalist, may become a wallflower, and may, as a result, tend to avoid dances and other social affairs. In this case, the obvious remedy is training in dancing and in social conversation. Similarly, other forms of training may be helpful in developing greater self-confidence and a more desirable social personality.

The Intellectually Superior.—On the whole the schools have been more concerned about children of inferior capacity than about the welfare and progress of the superior. It is worth recalling that the Binet intelligence tests were developed specifically for the purpose of locating the children who were likely to have difficulty in learning in school. Only after this and later intelligence tests were developed was it fully appreciated that there are equally important—if not more important—problems in connection with the education of the intellectually superior.

From a broad social point of view it should be recognized that it is the superior who staff the professions, who become the leaders in business and in government, and who are responsible for most of the inventions, discoveries, and social progress that takes place. Also, the superior spend, on the average, more time in the school system in the process of acquiring an education. It would seem, there-

fore, that the educational system has a special obligation to make the best possible provisions for their training.

Since IQ's as determined by current intelligence tests tend to be correlated with socio-economic status, it is to be expected that the average cultural status of superior children will be good, and this has been confirmed by several investigations; but, as Lewis¹⁵ has pointed out, some children with high IQ's come from homes in poor economic circumstances. In his study, ten out of fifty cases with IQ's above 145 came from homes that were rated as at the poverty level. It is evident, therefore, that such children have widely variable economic backgrounds which range from the very poor to the excellent; and this naturally becomes a factor of great importance in connection with college and professional education.

Studies of genius have shown that many more men than women have been rated as geniuses; but studies of children on the basis of scores on intelligence tests have given conflicting results. Terman's²⁹ study of superior children in California, for example, indicated an excess of superior boys, but a study by Lewis,¹³ which was based on the highest scores in a group of 45,000 in grades four through eight who were tested with the Kuhlmann-Anderson Intelligence Test, showed an excess of girls. In the top 2 per cent of this group the ratio of girls to boys was 146.3 to 100. From this and other evidence it seems that any difference found in the numbers of superior boys and girls may depend as much on the methods used in selecting the cases as on sex differences. When selection is based on achievement tests and school marks, the average differences usually favor the girls. However, intellectual sex differences are not large enough to justify separate programs for superior boys and girls.

Contrary to some popular opinions, physical and mental growth are positively correlated, and, as we might infer from this fact, superior children tend to be above their chronological age norms in height, in weight, in health, in physical strength, and in motor capacities in general. These correlations are, however, not high and consequently there is wide variability in the physical characteristics of the superior. Some intellectually superior children are under-

sized and sickly weaklings, but fortunately they are not typical of the group as a whole.

Studies of the personalities of the superior have also shown a positive correlation with intelligence. Hildreth,⁸ on the basis of a study of young children, reports that favorable character traits are noted about five times as often in the superior as in the normal. The intellectually superior were rated as superior in energy, in sense of humor and in willingness to face difficulties, and they were also considered to be more independent and more self-assured. Lewis found the most differentiating characteristic of the superior to be a more adventuresome spirit. Other characteristics which their teachers considered to be outstanding were: ". . . ambitious, dependable, energetic, friendly, happy, honest, investigative, leader, likes jokes, original, polite, and tidy"¹⁴ (p. 305).

McElwee,¹⁷ on the basis of a study of school retardation and acceleration, found the accelerated pupils to have more desirable positive traits than the retarded, but he found the greatest difference in the number of undesirable traits. The retarded were more often quarrelsome, excitable, restless, stubborn, and listless. At the college level, Remmers²³ found distinguished students to be outstanding in co-operative ability, industry, initiative, judgment, and leadership. Also he noted that the distinguished more often came from small families and were more often only children. Similar results have been reported by other investigators.

When students with high IQ's are classified into groups on the basis of school achievement, the high achievers are usually rated as having better personalities. Lewis, for example, reports that the high achievers are more dependable, honest, original, self-reliant, ambitious, investigative, and precocious; while, in contrast, the children with high intelligence and relatively low achievement showed more undesirable traits, such as lying, over-critical, rude, stubborn, over-sensitive, and unhappy¹⁵ (p. 211).

Terman and Oden²⁹ found that high achievers came, on the average, from better homes than low achievers; but Musselman,¹⁹ in contrast, found that children who had handicaps such as broken homes, foreign extraction, poor parental health, and poor personality

adjustment tended to have high achievement ratios. This apparent disagreement may, however, be reconciled perhaps by assuming that a good home environment is normally an asset and that relatively more children from good homes will have good achievement records, but in other instances, a poor background may result in a greater compensatory drive to achieve a better status. In this case, of course, there will be a smaller number of children from poor homes who have high achievement.

As was noted in connection with the discussion of the physical characteristics of the superior, the correlation between intelligence and personality traits is not very high, and consequently there are many exceptions to the general trend. Some children with high IQ's do not have good personalities and some make very poor social adjustments. As Hollingworth,¹⁰ among others, has pointed out, the intellectually superior child has some special problems in the field of personality and social adjustment. The more superior the child is intellectually, the more difficult he finds the problem of social adjustment. He is too small usually to compete on equal terms with average children of the same mental age, and he usually lacks also the social maturity and social interests of average children of his mental age. Because of these differences, and because of superior intellectual capacity and interests, the superior child may not be too well accepted by average children and thus may tend to become an isolate. Also, as Neville²¹ points out, superior children are frequently nervous, over-sensitive, and over-anxious. The superior are often very ambitious and set standards for themselves that are hard to attain, with the result that they may be dissatisfied even when their achievement is superior.

When students are selected on the basis of high IQ's, there is considerable variation in the strength of their special capacities. Since the intelligence tests usually used in schools emphasize the understanding of verbal materials, the most marked variability will be found in the capacities for mastering numerical, spatial, artistic, musical, mechanical, and social relationships. Some children with high IQ's will be found who are weak in these special capacities, and, for that reason, they may be handicapped in school work in special

subjects even though their general intelligence and achievement are superior.

When standardized achievement tests in reading, spelling, and arithmetic are given to college students, the resulting variability in scores gives a shock to some who are not familiar with the specialized weaknesses of students who are generally superior. Some college students are exceptionally weak in one or more of these elementary school subjects and may score as low as fourth or fifth grade norms or even lower. Some, even of the students who are English majors, are rather poor in spelling, and some of the science majors are exceptionally poor in English composition. Consequently some of these individuals would profit much more from remedial work at the elementary school level than they will profit from taking some of the college courses they are required to take; but college faculties are likely to be slow about giving credit for elementary school work even if, in particular cases, such training is more vitally needed than is a knowledge of the courses at the college level. However, at least one college gives achievement tests to incoming students who have had a foreign language in high school and plan to continue it in college, and, in case of students who make low scores, they are permitted to repeat the first year of the language with full college credit. An extension of this sound educational principle to other subject areas would seem to be desirable. But, whether credit is given or not, many college students need such review and remedial work.

Another important problem arises in connection with the reliability of high IQ's. What happens when children who have received high ratings on intelligence tests are retested? The results here seem to depend on several conflicting factors, and, as a result, the studies of this problem have at times disagreed.

Since tests and retests are not perfectly correlated, and since retest correlations tend to become progressively lower as the time interval between tests increases, the principle of statistical regression, if considered alone, would lead us to expect retest IQ's for superior children to be lower, and to become progressively lower with the passage of time. In some cases this has been found. In Terman's²⁹

study there was evidence of regression and this was greater for girls than for boys.

On the other hand, bright children profit from the experience of taking tests, and since tests are never entirely free from the effects of school experience, and since bright children have on the average learned more in school, we might expect the IQ's of bright children to increase on later tests. This seems to be the result that is most often found.²

Customary methods of calculating IQ's may also be favorable to increases in the IQ's of bright children after the age of sixteen years. It is a common practice to stop considering increases in chronological age after sixteen years in calculating the IQ, but several studies have shown that, as measured by current intelligence tests, mental growth continues until about the age of twenty years. On this basis, any mental growth that takes place after the chronological age of sixteen should result in an increase in the IQ, and this probably favors the superior individual. In actual practice, then, the factors that would produce regression and lower IQ's in the superior on later tests may be counteracted, and even higher IQ's may be found; but the actual results found in any given study seem to depend on the tests used and the ages of the subjects tested.

The school achievement of superior children is good, but it is not generally equal to that of average children of the same mental age. Statistical regression operates here as in other cases.

This fact has disturbed many educators who seem to feel that achievement should be exactly commensurate with intelligence. Actually, however, since school achievement depends on numerous variable factors other than intelligence, and since correlations are lowered by errors of measurement, it is not to be expected that intelligence and achievement will be perfectly correlated. It is almost inevitable that, when a group is selected for high intelligence, the average achievement score will be below the average intelligence score. This is not to say that the achievement of the intellectually superior cannot be improved; for it probably can be; but it is to say that achievement cannot always be expected to equal intelligence level.

If, instead of selecting a group on the basis of high intelligence, we selected them on the basis of high achievement, the same principle would operate, and in that case the average intelligence level would be lower than the average achievement level. If, consequently, we wish to be proud of the accomplishments of our schools, we should select a group of high achievers for study!

The actual achievement record of the Terman group of superior children was excellent. About 90 per cent of them entered college, and about 93 per cent of these graduated. Furthermore, about two-thirds of the men and one-half of the women who graduated from college attended graduate school, and, as might be expected, this group earned a relatively large number of scholarships and other academic honors.

The schools must of necessity cater primarily to average students, but average school programs are not ideally suited to the superior. This raises the question as to what can and should be done to give the best training to the superior.

Before the development of intelligence tests, bright children in the elementary school were frequently permitted to skip grades as a means of accelerating their progress, whereas in high school and college they were—and are—often permitted to carry heavier than average loads. When intelligence tests came into use, and pupils were classified on the basis of ability, the bright sections were often permitted to cover more than one grade in a year and thus to finish high school at an early age. However, educational opinion soon tended to oppose acceleration and to favor enrichment of the program instead so that superior children would take about the normal time to get through high school but would have covered a great deal more material during that period.

Largely because of the long educational program required for admission to the practice of the professions there has recently been an increased interest in making it easier for superior students to enter college and so to finish college and professional school at an earlier age.

Actual studies of the attainment of younger students in college have been almost uniformly favorable. Younger than average students have made excellent records, and, as Pressey has found, their

success after graduation, as indicated by the proportion winning national recognition, is greater.²² His results are shown in Figure 36.

The social adjustment of younger students in college has also been generally good, although in the more extreme cases, because of immaturity, participation in college social events is necessarily limited. For example, the writer had one student who graduated

from college just after his fourteenth birthday and so was obviously not in a position to take much part in college dances and similar social events.

However, even if we agree that such extreme intellectual acceleration presents some serious problems, we must also agree that the failure to speed up the progress of such students through the schools might present even more serious difficulties in intellectual adjustment which might in turn lead to personality difficulties. One of the fundamental requisites

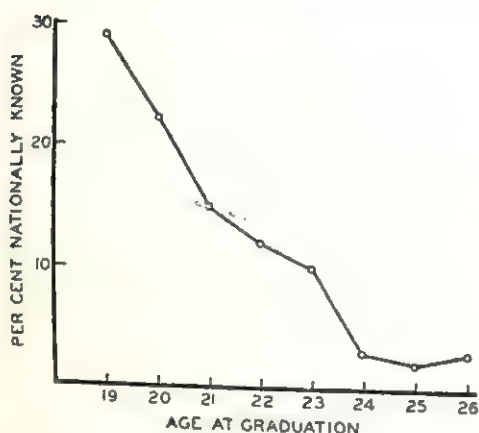


FIG. 36.—Age of college graduation and success in adult life. Based on 924 American-born Amherst graduates who lived to the age of 50 or later and who graduated between 1880 and 1900. From Pressey (22). By Courtesy of the Journal of Applied Psychology and of the American Psychological Association.

for good adjustment is that the individual must have tasks suited to his abilities; and certainly the boy who is capable of superior work in advanced college courses would not be intellectually well adjusted if he were in the eighth or ninth grade.

When intellectually superior children are accelerated and are placed in groups of average children of the same mental age, there are likely to be some difficulties in adjustment in extracurricular activities. Such bright children may also show evidences of mental immaturity in their interests in literature and social science. For this reason, there will be fewer problems when superior children are

placed in a reasonably homogeneous group along with other superior children.

In cities large enough to make it financially practicable, the best solution would seem to be to develop special curricula for the superior with specially trained teachers. This has been done, for example, in Cleveland, Ohio.²⁷ Children with IQ's of 120 and above have been placed in special groups and have been given what has been known as a Major Work program. This is done from the first grade through the twelfth grade. In this case, emphasis has been placed on enrichment of the curriculum rather than acceleration. It is assumed that these children are more likely to be social leaders and for that reason a special effort is made to develop more social responsibility and democratic leadership. In addition to the regular curriculum, broader training is given in music, art, literature, and science. More attention is given to individual aptitudes and to vocational possibilities. The teachers have a great deal of freedom in the development of this work; and the groups are limited to 20 or 25 to make it possible to give more attention to individual needs.

In May, 1937, the Progressive Achievement Tests were given to these Major Work classes and it was found that the average achievement was more than two years above that of average children of the same chronological age, but it was not equal to that of average children of the same mental age. In addition to better achievement, the teachers thought the group had better social attitudes and showed more originality, imagination, and resourcefulness in dealing with intellectual problems. It was also believed that they probably showed more critical thinking and more vocational ambition than children of the same intelligence level who had not been in the Major Work program. A critical evaluation of this program seemed, therefore, to justify its continuation.

The question as to the relative merits of acceleration versus enrichment for superior students is still unsettled. The solution accepted is likely to depend to a considerable extent on practical considerations. Many bright children have been accelerated by several years and have made excellent records, but we cannot now offer conclusive proof as to which is the better plan.

Probably a combination of enrichment and acceleration is to be recommended on the ground that enrichment will provide a broader education while acceleration will make it possible for able students to enter the professions at a more reasonable age.

As a group, intellectually superior students are able to learn more rapidly and to cover more material than average students; but the correlation between intellectual level and speed is not high, and, as a result, some superior students are slow workers and take even longer than average students to do their work. Such students are likely also to get relatively low scores on group intelligence tests that emphasize the speed factor. One of the writer's brilliant but slow students made a below average score on the American Council Psychological Examination, but, nonetheless, he made a superior college record, later received the Ph.D. degree, and is now a successful university instructor. Such students have superior intelligence as far as level goes but they are not able to work fast enough to do the amount of work required for a greatly enriched program, and they are likely also to have difficulties with an accelerated program. In such cases, classification with an average group may be the best solution.

Since World War II, the costs of higher education have increased very greatly with the result that college and professional education have come to be restricted to an undue extent to those of better than average financial circumstances. Since the correlation between intelligence and economic status is not very high, there will be many intellectually superior children who will not be able without outside financial assistance to go beyond high school. When this fact is more widely known, perhaps more and larger scholarships will be made available for needy and deserving high school graduates. Only when such assistance is provided will many of these students be prepared to render the service of which they are capable.

QUESTIONS AND EXERCISES

1. What change has occurred in our concept of the exceptional child as a result of the development of mental measurements?
2. Why do the mental age and the IQ give an incomplete picture of a child's mental capacity?

3. What are the more common types of visual defects?
4. What classes of the feeble-minded are in institutions? What classes are usually not in institutions?
5. What are the most important intellectual differences between defectives and normals?
6. What suggestions as to teaching methods would you give to a teacher who is about to begin work with a group of retarded children?
7. What kind of achievement records have delinquents usually made in school? On this basis, how may the schools have contributed to delinquency?
8. What have empirical studies shown as to the socio-economic status of the intellectually superior?
9. How may we account for the conflicting statistics on the relative numbers of superior boys and girls?
10. How do the physical characteristics and the personality characteristics of the superior compare with those of the normal?
11. What are the special problems of social adjustment encountered by superior children?
12. When children with high IQ's have been retested, what has been found? Explain.
13. How does the school achievement of superior children compare with their IQ's? Why is this true?
14. What are the arguments for and against accelerating superior children in school?
15. Why are more scholarships needed for superior children at the college level?

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CHAPTER 16

COUNSELING AND GUIDANCE

One of the most significant trends in the field of education during the twentieth century has been in the direction of attempting to adjust training more closely to individual needs. Early in the century this took the form of increasing the number of courses offered and of giving greater freedom of election so that students were permitted to choose to a considerable extent the subjects they would take. It was, however, soon realized that freedom of choice was not enough. Students were likely to make many unwise choices if they did not have special assistance in making out their programs. This is reflected in a story about a student who had registered for a very unusual combination of courses and was asked by a friend how he had happened to pick those particular ones. He is said to have explained that his choice was based on three criteria: (1) none of the courses came before nine o'clock; (2) none came in the afternoon; and (3) all met on the first floor so that he did not have to climb stairs!

With the development, soon after 1900, of standardized tests of intelligence and of achievement and the resultant increase in the understanding of the psychology of individual differences, a more scientific basis was provided for a better understanding of individual abilities, interests, and needs, and for giving on this basis better guidance. This trend had been emphasized by the fact that, as more and more scientific studies have been made, the tendency has been to analyze personality and intellectual traits into smaller and smaller units and to find that these more specialized traits and abilities are not generally very highly correlated. This has meant practically that each individual has a unique pattern of psychological traits and, consequently, of educational needs. For this reason, the varying needs of different individuals cannot be met adequately by mass methods of education alone.

This psychological basis for special attention to the problem of guidance has a correlate in the development of thousands of specialized jobs in business and industry. In a primitive economy there is relatively little variety in the work done by different individuals, and for that reason there is very little chance for vocational choice. In 1500, the American Indian youth did not need special educational and vocational guidance; he was destined to hunt, fish, and fight; and consequently his training could be directed with confidence toward the development of skill in those activities—unless perhaps he was enough of a freak to become a medicine man or to perform some other very unusual tribal service.

In our highly industrialized civilization of the twentieth century, in contrast, there are a number of vital choices to be made before the individual arrives at the adult level and settles down to follow a vocation and perhaps to raise a family. Moreover, some of these choices have an important relation to the amount and kind of education that is needed to provide for adult living.

It seems rather obvious that intelligent choices cannot be made without accurate knowledge as to alternatives. In this case the knowledge that is essential has to do in the first place with job characteristics and openings and in the second place with the characteristics and possibilities of the individuals themselves. Since the average youth knows relatively little about the thousands of possible job openings and also has very little exact knowledge about his own vocational possibilities, it is essential that adequate knowledge in both of these areas be provided in order that serious errors in vocational selection may as far as possible be avoided. This is a most important part of the problem of counseling and guidance.

In addition, the complexities of modern competitive civilization have placed the individual under a great deal more strain than was usually characteristic of primitive life, and, as a result, personality maladjustments are now more common and require more attention.

To some extent these needs can be met by group methods, as by group discussions, and by courses in personality adjustment, in mental hygiene, and in marriage and family relations, but since such problems tend to be highly individualized, they present a further area for assistance in the field of counseling and guidance.

Guidance problems tend to be interrelated and overlapping; but for convenience in discussion, they may be divided into three areas: (1) personal and social, (2) vocational, and (3) educational. We shall discuss them in that order; but first it will be helpful to discuss some of the more general aspects of the problems.

SOME GENERAL CONSIDERATIONS

The general aim of guidance work is to assist individuals to make the most satisfying and most effective adjustment possible to their environment. This will require different kinds of assistance and of training, but, first of all, it requires a detailed knowledge of the important relevant characteristics and of the further relevant assets and liabilities of individuals.

Under important characteristics will be included such things as personality traits, interests and aspirations, intellectual capacities, past achievement, sensory and motor defects, health, physique, and general appearance. Under further assets and liabilities, we may need to include such items as socio-economic status and family connections and influences. This is for the reason that many of the problems that students have arise in large measure from their family and other social associations and backgrounds; and, not infrequently, the vocational possibilities of students are limited by economic status. A girl, for example, who wishes to enter the field of medicine will obviously need more financial support from her parents than if she plans to marry early and become a housewife.

If, then, the schools are to provide the most effective guidance for students, it is necessary that a great deal of information be collected and made available both to counselors and, in large measure, to the students themselves. This should include at least the following: records of several intelligence tests, with separate scores for specialized capacities such as verbal, numerical, and spatial; measurement of special capacities in music, or art, or mechanics, when these are relevant; a cumulative record of school achievement as indicated both by standardized achievement tests, with separate scores in different fields, and by school marks; tests of scholastic and of vocational interests; and such tests and rating of personality and of

personal and social adjustment as may be found useful. To this should be added any additional data of importance, such as health record, disciplinary difficulties in school, and activities outside of school. In other words, a rather complete picture of the capabilities, interests, and activities of the individual is needed; and this information must actually be used by the counselor. In the past, too many thousands of standardized tests have been given without making use of the results to assist the individuals most concerned.

What we have just attempted to say in some detail is frequently stated in more general form by saying that guidance is concerned with the whole individual. A fairly complete knowledge of the individual and of his environment may be needed in order to deal with problems of adjustment and of vocational and educational guidance. Since counseling and guidance will often involve problems of personality adjustment and mental hygiene, it is evident that special training and experience in those areas are necessary if the problems encountered are to be handled properly. Otherwise guidance may fall into the category of having the blind led by the blind.

Further information is necessary for effective vocational and educational guidance, but the discussion of this will be deferred until later. It must suffice here to state that good vocational and educational guidance is impossible without a great deal of knowledge about those fields as well as a great deal of knowledge about the individual students themselves.

This raises the question as to who should do counseling and guidance work. Is it to be done by average classroom teachers or by specialists? Stone¹⁸ canvassed 590 school superintendents on this problem and received 498 replies. Of these, 275 favored a special guidance credential, 186 opposed it, and 37 were undecided. The actual extent of the specialization of guidance functions at the time of this report (January, 1950) was indicated by the fact that 182 superintendents reported a total of 673 persons employed as guidance workers for half time or more and by the further fact that fifteen states already had special credentials for counselors and personnel workers.

Those superintendents who favored a special credential generally held that special training was required for effective guidance work.

The administrators who opposed a special credential thought that all teachers should have training in guidance and that small schools especially could not afford to have a number of different kinds of specialists on their teaching staffs. These administrators also tended to stress the point that personality qualifications such as pleasing personality, rapport, and interest in people are often more important than specialized training.

It may be theoretically desirable for all teachers to be trained in guidance work, but a realistic appraisal of the present situation will indicate that only a relatively small minority of the entire teaching staff can be expected to have much specialized training in this field. At the same time it is probably true that most of the counseling and guidance will be done, for a long time at least, by average teachers. If this somewhat pessimistic appraisal is correct, the practical answer would seem to be to give to all teachers as much training in guidance as is practicable and at the same time to train and employ as many specialists as costs and conditions warrant. In large cities, and in some large universities, social case workers and psychiatrists will also be needed as part of the team of personnel workers.

Since certification requirements for average teachers have not generally included training in personnel work, only a small fraction of the teaching staff has had such preservice training. This suggests that inservice training will be necessary to meet existing needs. This, however, is characteristic of all progressive movements in education. When changes are to be introduced, the existing teaching staff will have to acquire the new methods, techniques, and knowledge required. Plans should consequently be made to give this inservice training to the existing teaching staff.

Warters²⁵ (p. 197) suggests that study groups, conferences, workshops, and institutes are more helpful than faculty meetings and lectures, and she further urges that a trained leader is essential for best results. If, then, no member of the school staff is properly trained, a suitable person should be brought in from the outside.

The Problem of Prediction.—Both vocational guidance and educational guidance involve the theoretical and the practical problem of predicting the probable success of students in occupations and in

school courses, but because of the complexity of the problem and the lack of accurate information in many areas, such predictions very often cannot be precise. This depends on two different kinds of causes: (1) measurements of characteristics, such as intelligence, often involve large errors when future status in that characteristic is predicted; and (2) success in a school course or in a vocation depends on numerous factors, some of which cannot be measured at all accurately, and no one of which correlates very highly with achievement.

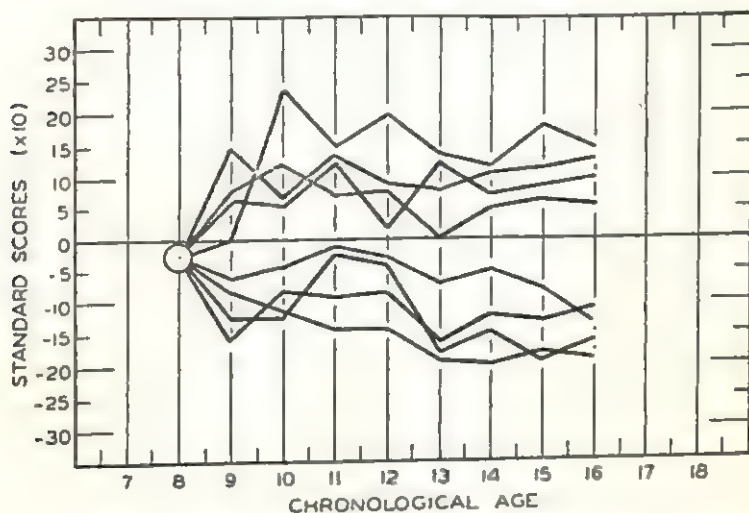


FIG. 37.—Variability of eight girls in mental growth. Together at eight years, they diverge widely at sixteen years. Dearborn and Rothney (4, p. 183).

On the first point, in spite of claims that the IQ is constant or relatively so, actual measurements show numerous cases of rather wide divergence in scores when measurements are repeated at later dates. Figure 37 gives some examples of this from the Harvard Growth Study.⁴ Children who have made the same score on a test at one age may diverge widely at a later age. In general the longer the time interval between tests, the lower the correlation between them, and the less the predictive value of the earlier test. For this reason it is hazardous to accept without reservations the results of any one test of intelligence, of achievement, or of personality.

On the second point, predictions of probable success in an activity must take into account numerous factors concerning which no accurate information is available, while in case of characteristics such as intelligence, for which we do have relatively valid and reliable measurements, the correlation with achievement is usually not high. For example, the correlation between intelligence test scores and grade point averages in college is usually below .60; but even with a correlation of .60, the error of prediction (standard error of estimate) is reduced by only 20 per cent from what it would be on the basis of pure chance. However, by combining various tests and ratings, reasonably accurate predictions can be made both for those individuals with very high scores and for those with very low scores, but not for those with average scores. That is, we may safely tell some high-score students that they will very probably be able to succeed and we may inform some low-score students that their success does not seem likely, but between these extremes there will be a larger degree of uncertainty.

Vocational possibilities also depend on the number of openings in different fields and on the possibility of obtaining suitable training. These may be influenced by such conditions as the ups and downs of the business cycle and by changes in government expenditures. After World War II, for example, the demands for college, graduate, and professional training were so great that thousands of qualified students were turned away from schools. Specifically this meant that in order to get into a medical school, a much better academic record was required than would have been necessary ten years earlier. These shifts in the balance between supply and demand obviously complicate the problem of intelligent guidance. The most that the counselor can do here is to present to the student the known facts and apparent probabilities and then leave it to him to assume the responsibility for the decision. More accurate predictions in the future will depend both on the validation and accurate weighting of tests of vocational fitness and on the more accurate prediction of the probable future demand for different types of workers. Applied psychology can offer a great deal of assistance in solving the first problem, but the second problem falls rather in the field of economics and is probably beyond the scope of the average personnel worker.

Directive versus Nondirective Counseling.—Experts differ on the question as to how much responsibility a counselor should assume while doing guidance work. Some seem to feel that a counselor should function in a manner similar to that of a physician; he examines a case, arrives at a diagnosis, and prescribes treatment. When counseling is done in this way it is directive counseling. It may or may not bring conviction and satisfaction to the student, but it can probably be justified in some cases in which a student, seems to need outside assistance in arriving at a decision. However, most guidance workers prefer to supply the counselee with all necessary information and then to permit him to arrive at his own decisions. This is nondirective counseling.

Nondirective counseling is psychologically sounder in most instances in that it places the responsibility on the individual who is most concerned and it gives greater assurance that the program will be actually carried through for the reason that a person is more likely to persist in a course of action if he really believes in it and desires to achieve the stated goal. When a counselor assumes the responsibility for making vital decisions, he may also have to assume the responsibility when plans are not realized, and this would seem to be an unnecessary risk. In general, therefore it is probably better for the counselor to endeavor to assist the student to think through his problems and to arrive at his own decisions.

Nondirective counseling obviously requires that the student be given more complete information than is necessary in case of directive counseling, and this will include such items as low scores on intelligence tests and unfavorable personality ratings. Some counselors feel that it is unwise to report very low scores to students because of the danger of developing strong feelings of inferiority and they also tend to hold that the reporting of very high scores is perhaps equally objectionable since it may cause the development of an undesirable brand of egotism. However, as we have emphasized, intelligent choice of either a vocation or of an educational program generally requires rather accurate knowledge of one's actual assets and liabilities. If a student probably does not have the ability to succeed in a vocation or in a course, it would seem kinder in the long run to inform him at once and to attempt to save him from

wasting a great deal of time and effort in trying to realize an objective that is probably not within his capacity. In case of a very superior student, a knowledge of superiority is necessary to permit the planning of a program that is commensurate with ability. There have been numerous instances in which individuals have learned that they have made high scores on intelligence tests and, as a result, have raised their levels of aspiration. Self-confidence is an essential psychological asset for those who attempt difficult tasks, and knowledge of test results can be an important rational basis for confidence. For this reason it would hardly seem wise to withhold such information because of the possibility that, in a few instances, it may lead to the development of undesirable egoistic feelings.

One of the most important values of the standardized intelligence and achievement tests that are given in the senior year of high school, in the sophomore year of college, and in the senior year of college, is found in the fact that they afford a more rational basis for planning future programs. If, for example, at the end of the sophomore year in college a student earns a high score in achievement tests in mathematics and physics, he can be told that he can probably plan with confidence to go on to a Ph.D. degree in those subjects. If he also understands that he will have to do a lot of hard work to achieve such an objective, it should not lead to undesirable feelings of superiority.

Capacity, Interest, and Level of Aspiration.—Modern psychology has shown rather conclusively that human nature is very complex and that correlations between different abilities, interests, and personality traits are not usually very high. Garretson,⁷ for example, administered a preference questionnaire similar to the Strong Vocational Interest Blank to ninth graders and found little correlation (r 's between $-.304$ and $.19$) between expressed preferences and actual achievement in the curriculum. Moffie¹³ had 80 N. Y. A. students, all boys, with an average age of 18.7 years, estimate their interests in different vocations, and he then correlated these estimates with ratings on the Strong Vocational Interest Blank. For six occupational groups the correlations ranged from

-.07 to .47, and for 20 single occupations the range was from -.05 to .54. Musician was highest with .54, and personnel worker was next with .53. For psychologist the figure was $.20 \pm .07$. Only one group scale, that for banker, office man, accountant and purchasing agent, showed any appreciable correlation, and this was too low to be of much value for individual prediction.

These and other studies indicate that guidance workers must be prepared to find great discrepancies between interests, abilities, and levels of aspiration, and between expressed interests and interest scores as determined by current tests. Students often have little interest in the vocations they would be able to do successfully; they often lack ability in areas where they seem to be interested; and their level of aspiration is often either much too high or too low for their ability.

These facts present some of the gravest problems for personnel workers. If a student thinks he is interested in medicine but is actually interested in it only to the extent of acquiring the social prestige and the income normally associated with successful medical practice, he is very likely to find his motivation inadequate when he confronts the hard work and the long hours in a medical course. Many students express an interest in psychology when their actual interest is not in psychology as a science but is rather in it as a tool in social work or in some other line. Also, in too many cases, students attempt to prepare for a vocation that has been selected for them by one or both of their parents without too much regard for either the interests or the abilities of the students themselves. Very careful analysis will be necessary in many of these cases in order to make it clear to the student just what he actually desires from a vocation.

When a student has the misfortune to have abilities in one area and interests in a different direction, the problem will arise as to how to develop interest in the field in which his greatest ability lies. One step is to encourage him to take courses along the line of his abilities. Interests often grow with successful experience in a field. He can also be encouraged to read about the possibilities of the new field, and perhaps to talk with individuals who are successfully engaged

that the counselor will need to be a combination of an expert clinical psychologist and an educator as well.

Personal and Social Guidance.—Although educational practice has not kept up with theory, one of the most important trends in contemporary education has been in the direction of an increased emphasis on improving the personal and social adjustments of students. Since students represent rather completely the total population, it is evident that collectively they have all of the difficulties that occur at their ages. These include, among other things, a long list of physical and medical handicaps, economic difficulties, home and other social maladjustments, deficiencies in general intelligence and in specialized abilities, and lack of interest in school work.

Some students will have difficulties that result largely from single causal factors, but in a large proportion of the cases the causes are complex. Undesirable conditions, such as low socio-economic status, malnutrition, poor home environment, medical disabilities, and low frustration tolerance, tend to be associated, and for this reason counselors should avoid the error of placing too much emphasis on any single causal factor.

Health is often a very important factor in adjustment since it may be the source of secret worry on the part of a student. It is not to be expected that the average counselor in school will be a competent medical diagnostician, but perhaps it is not too much to ask counselors to be familiar with some of the more familiar symptoms associated with such common defects as poor vision, infections of the teeth and tonsils, and high and low basal metabolic rates. Then, of course, when trouble is suspected in one of these areas, the student can be advised to secure competent medical attention; or the parents can be given this advice in case of young children.

Other personality difficulties are related to home conditions and may require conferences with parents, if such conferences are possible. Kavin¹² suggests that teachers visit parents very soon after becoming the child's teacher and endeavor to establish friendly relationships so that when problems arise later it will be possible to approach the parents on the basis of an already established friendly contact. This is an excellent recommendation at the elementary

school level, but it is hardly practical for teachers in high school who have large classes, and it is usually impossible for counselors in residence colleges.

Emotional difficulties are common during the entire school period as well as during adulthood, and psychoanalytic theory suggests that many of the emotional maladjustments of adults date back to maladjustments in childhood. This suggests the desirability of locating these difficulties early and correcting them as far as is possible during childhood.

Specifically, the counselor will need to obtain information as to the individual's home adjustment, his social adjustment with those of his own age, and his school adjustment. Special attention should be given to aspirations and to frustrations. A child who lives in a poor environment and has some serious difficulties with parents or with associates may nevertheless be reasonably happy and fairly well adjusted, while another child in a more favorable psychological environment, because of the nature of his temperament and of his aspirations, may be quite unhappy. The crucial problem is therefore to determine how the individual is reacting to his environment.

The first problem here is to analyze and to define the problems that the student feels. The next step usually is to give the student a clear understanding of the problem. Then comes the task of making such changes in the student's environment or in the student himself as may be needed in order to make a better adjustment. In many cases the discussion of the problem with another person will do a great deal to relieve the tension, and this principle has been extensively applied both in the field of religion and in that of the psychoanalytic treatment of mental disorders.

When a boy or a girl lacks a satisfactory degree of social acceptance and popularity with his or her own age group, the reasons for this can be determined by sociometric techniques or by other methods, and suggestions and plans can be worked out to bring about better acceptance. This may require the development of appropriate social skills, such as dancing or social conversation, and it will very often require participation in appropriate extracurricular activities. The main point is that the sources of the difficulty are to be located

and specific methods are to be suggested to bring about improvement. Unfortunately, however, it will also be necessary in many cases to help students to accept as philosophically as possible some of the unpleasant realities of life. Many of the boys and girls in school will obviously be quite unable to acquire the faces, figures, and fortunes of their heroes and heroines in the movies, and consequently if they are to escape unnecessary feelings of frustration, it will be necessary for them to accept more realistic aspirations.

In order for the counselor to deal with these problems effectively it is imperative that he have good rapport with the students concerned and that he have their complete confidence. For this reason, school officials, such as principals and deans, who may also be charged with responsibility for school discipline, are unlikely to be able to deal effectively with the adjustment problems of students. Students are more likely to take their more personal problems to those teachers who have their confidence regardless of whether these teachers have had special training in counseling or not.

Vocational Guidance.—Since intelligent educational guidance in high school and college is impossible without considering the future occupational status of the individual, we shall consider next the problem of vocational guidance.

Different occupations and jobs in business and industry vary greatly in the traits required for successful performance, and this variation extends even to jobs that go by the same name. Clerical work, for example, covers a great variety of specialized types of work which may have little in common. One "clerk" may wrap packages, another may keep stock records, another may do filing, another may answer a telephone and make appointments, and so on. Individuals also differ greatly both in single traits and in combinations of traits, and, as we have already noted, the correlations between sensory, motor, intellectual, and personality characteristics tend to be low.

As a result of this diversity, both in jobs and in individuals, the task of finding the job for which the individual is best fitted is an exceptionally difficult one. The available evidence shows that the vocational choices made by students are too often not in harmony

with vocational opportunities or with the capabilities of the students themselves. In September 1949, for example, three medical schools, which admitted about 65 or 70 students each, or a total of about 200 students, had a total of about 5,000 applications. Even after allowing for duplications, this shows that most of these students would not be admitted to medical school. They had spent considerable time and money preparing themselves to study medicine but would be forced to prepare for some other occupation. Similar, but less serious, conditions are found in other fields, such as law and engineering.

This is brought out in a study by Sparling¹⁶ of the vocational choices of about 900 students in Long Island University. In this group, 16 years was the average age at which the first choice of a vocation was made, but only about one-third of the senior class retained the original choice. Marked discrepancies were found between the numbers of students preparing for particular vocations and the numbers of probable openings. There were, for example, about six times as many women preparing to teach foreign languages as could probably be placed in such positions. At that time (1933), 50 per cent of those preparing for medicine did not have grades high enough to get into medical school. About 75 per cent of those preparing to teach particular subjects had grades in those subjects that were below 80 per cent. From these figures it seems quite evident that a great deal of time and effort was being spent in preparing for positions that could not be obtained. Effective guidance might have reduced materially this discrepancy between vocational choices and vocational opportunities.

Sparling further found that 38 per cent of this group of students did no reading about the vocation of their choice and in most cases did not know very much about it, while only about 2 per cent had read comprehensively about the occupation.

Intelligent vocational choice requires rather exact knowledge of five different kinds: (1) a knowledge of the characteristics of the individual with particular reference to capacities, skills, knowledge, interests, and other relevant personality traits; (2) a knowledge of the nature of jobs and of the psychological characteristics necessary

for job success and satisfaction; (3) a knowledge of job openings and the possibilities of advancement in different types of jobs; (4) a knowledge of the training required before a worker is qualified for a given job, and (5) a knowledge of the possibilities of obtaining such training. Small wonder, then, that many vocational choices are not wisely made and that there is a great deal of vocational maladjustment!

Many counselors believe that the best starting point in vocational counseling is to attempt to determine the individual's aspirations and interests. A job factor sheet, which was developed by the Institute of Counseling, Testing and Guidance at Michigan State College, is shown on page 467f. This, or some similar outline, may well be filled out by the student. Such information will be useful to give the counselor a clear picture of what the student considers important about a job. It is also likely to be helpful to the student to face clearly the issues raised in filling out this blank.

There are now several good interest inventories available that may be used at the senior high school level and above. However, interests change with age and with education and experience; consequently the younger the individual, the less the predictive value of such interest inventories. There is also a great deal of individual variability in the extent to which changes in interests occur with age. Some children have rather definite vocational goals as early as junior high school and do not change these goals very materially later, while others may follow a vocation for some years and then change to some different type of work. For this and other reasons, the results obtained from interest inventories should be considered important but not conclusive.

The Strong Vocational Interest Blank has different forms for men and women and can be scored for about 40 different vocations for men and for about 25 for women. Combined scales for occupational groups are also available and can be used for preliminary surveys of occupational interests.

The Strong blank is scored in terms of interests in different vocations; but Thurstone²² has made a factor analysis of some of these vocational interests to show the extent to which they involve

JOB FACTOR SHEET *

<i>Factors I Consider Important in Choosing a Job</i>	<i>Very Important</i>	<i>Important</i>	<i>Not Important</i>
1. Certainty of continuous employment			
2. Opportunity for advancement.			
3. Opportunity to make money...			
4. Opportunity to use your own ideas			
5. Pleasant people to work with..			
6. Good hours			
7. Opportunity to learn a job....			
8. Opportunity to "do good for people"			
9. Variety of work			
10. Opportunity to be in a position of authority			
11. Having a good boss.....			
12. Having clean work			
13. Prestige of the job			
14. Opportunity for adventure...			
15. Opportunity for travel.....			
16. Chance to work inside or outside (Underline preference)			
17. Opportunity to become famous.			
18. Easy work			
19. Chance to use abilities			
20. Chance to use past training, education, or experience			
21. Chance to satisfy parent, relatives, or friends			
22. Chance to work for yourself...			
23. Chance easily to secure a job—little competition for positions			
24. Chance to do extensive study and research			
25. Chance to work in home community or in that general locality			

JOB FACTOR SHEET—Continued

26. Chance to continue education while at work			
27. Chance to work in or near a large city			
28. Chance to see and know a lot of people			
29. Chance to enter a new or a growing field			
30. Other factors			

* From *Organization and Administration of Guidance Services* by Erickson and Smith, p. 80. Copyright, 1947; courtesy of McGraw-Hill Book Co., New York.

TABLE 6. VARIATIONS IN FOUR TYPES OF INTERESTS IN EIGHTEEN PROFESSIONS (THURSTONE, 22)

<i>Profession</i>	<i>Science</i>	<i>Language</i>	<i>People</i>	<i>Business</i>
Advertising	-.48	+.66	-.21	+.22
Art	+.45	+.70	-.18	-.31
Certified public accountant...	-.04	+.32	.00	+.56
Chemistry	+.98	-.21	-.15	+.06
Engineering	+.84	-.36	-.22	+.16
Law	-.23	+.77	-.12	+.44
Ministry	+.09	+.51	+.62	-.30
Psychology	+.77	+.47	-.04	-.28
Teaching	+.36	+.15	+.68	-.22
Life insurance	-.82	-.02	+.27	+.45
Architecture	+.83	+.26	+.16	+.05
Y.M.C.A. secretary	-.23	.00	+.90	-.37
Farming	+.71	-.54	+.01	+.18
Purchasing agent	-.05	-.79	+.01	+.44
Journalism	-.15	+.84	-.28	+.25
Personnel	-.30	-.26	+.66	-.19
Real estate	-.76	-.07	-.06	+.58
Medicine	+.71	+.33	-.26	-.09

interest in science, in language, in people, and in business. This is shown in Table 6. This is very helpful in that it shows more clearly the nature of some of the more fundamental interests that contribute to different occupational interests. An analysis of the table will show, for example, that advertisers have a very strong interest in language, a greater than average interest in business, a less than average inter-

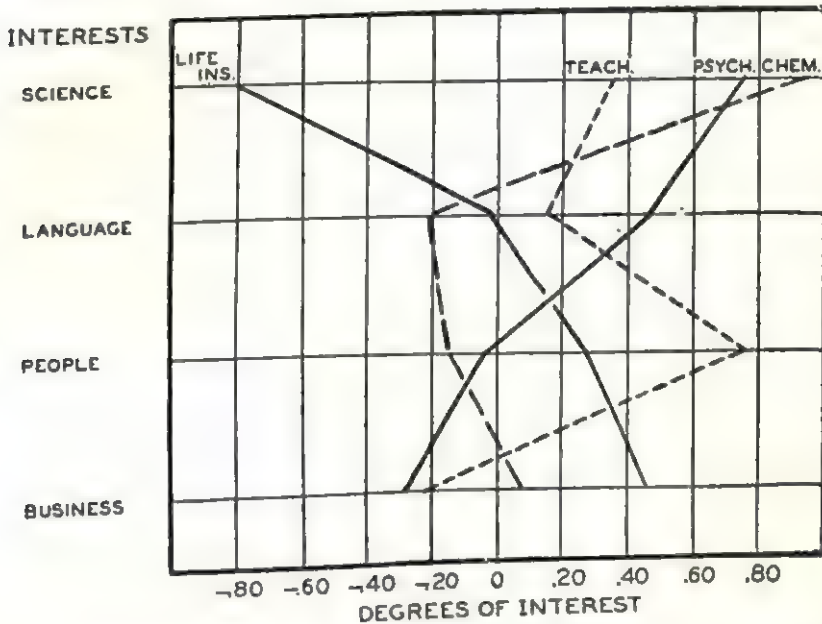


FIG. 38.—Variations in four types of interests for four occupations: Life Insurance, Teaching, Psychology, and Chemistry. A score of 0 indicates an average amount of interest; minus scores indicate less than average interest; and plus scores indicate more than average interest. Data from Thurstone (22).

est in people, and considerably less than an average interest in science. Chemists and life insurance salesmen are at opposite extremes for this group in their interest in science, though they do not differ very greatly in interest in language. Psychologists show a very strong interest in science, a strong interest in language, they have only an average interest in people, and their interest in business is less than average. In this respect the interest pattern of physicians is very similar to that of psychologists. The differences in these four interests in four vocations are shown in Figure 38.

The Kuder Preference Record gives an interest profile for nine types of interests: mechanical, computational, scientific, persuasive, artistic, literary, musical, social service, and clerical. It also supplies interest profiles for different occupations so that it is possible to

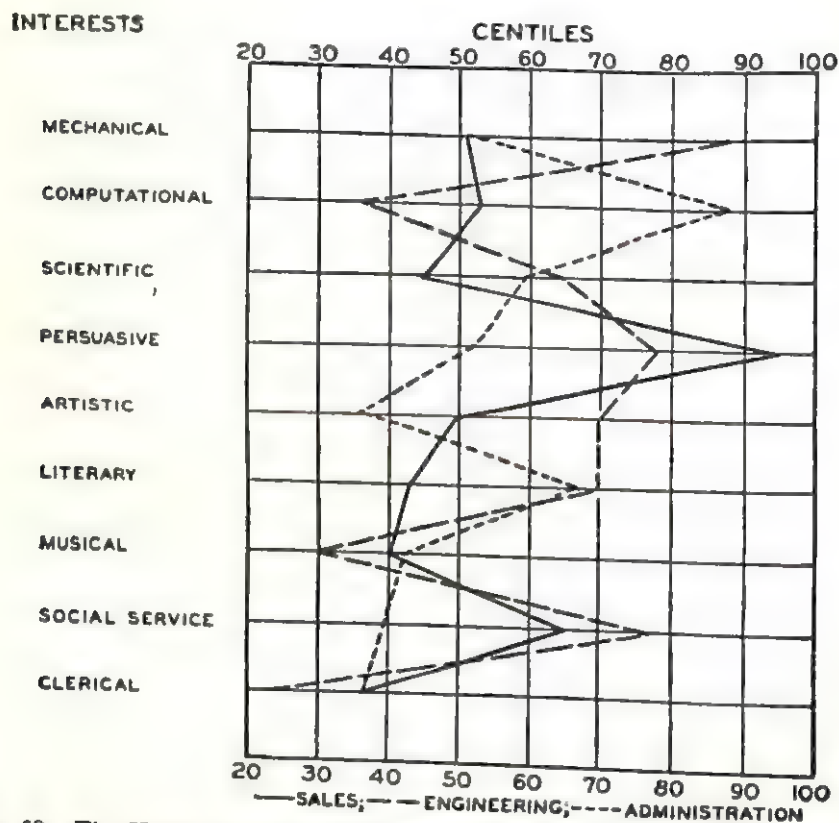


FIG. 39.—The Kuder Interest Test Patterns of Fire Protection Engineers, based on graduates of the Illinois Institute of Technology from 1920 to 1929. They had had an average of more than 20 years of experience. From Speer (17). By Courtesy of the Journal of Applied Psychology and of the American Psychological Association.

compare the interest profile of a particular individual with the profiles for different occupations. Figure 39 shows the differences in the interest profiles of technical school graduates who had been in three different kinds of work for about twenty years. It is not usually to be expected that individual interest patterns will conform closely to the published norms for any single occupation, but such

profiles make it possible to predict with fair accuracy the occupations an individual is likely to find most interesting.

The Guilford-Schneidman-Zimmerman Interest Survey gives an interest profile for nine types of interests as follows: Artistic, linguistic, scientific, mechanical, outdoor, business-political, social activity, personal assistance, and office work. It has an additional important feature in that separate scores are given for two aspects of each interest. For example, artistic interests are divided into appreciative interests and expressive interests. Outdoor interests are divided into the natural and the athletic. Office work is divided into clerical and numerical. Each of these interests is then further subdivided into hobby interests and vocational interests. A person might, for example, rank high in interest in the appreciation of music as a hobby but rank very low in the expressive aspect of music as a vocation: he might enjoy listening to good music but not be at all interested in trying to become a concert performer. A sample profile based on this survey is shown in Figure 40. Because of the fact that this test offers a more complete analysis of fundamental interests, it should prove to be a very useful instrument for counselors.

When an individual's interest pattern has been determined, the next problem is to consider his abilities, personality traits, and other characteristics that are significantly related to particular jobs.

Numerous studies have shown that intelligence and occupational status are correlated. Relatively high intelligence is required for success in the professions, for higher managerial positions in business, and for many high government offices. Much factory work, in contrast, does not require intelligence above the moron level. However, although the college-trained engineer must have high intelligence, it is not essential that the routine factory worker be a moron. As a result, there is actually more variation in the intelligence of unskilled workers than in the intelligence of highly trained professional workers. The practical implication of this for counselors is that individuals of relatively high intelligence may be successful and reasonably well satisfied in jobs that do not require much intelligence, but success in professional and higher level managerial jobs is unlikely without high ability. In addition, as has

a man to Mr. O'Connor with a note to test him and send him the bill! The man appeared to be nothing more than a typical bum picked up from somewhere on the lower east side in New York. He was caked with dirt, unshaven, ragged, and shabby, with the livid, unhealthy coloring that comes from prolonged improper food and unclean surroundings. In a whining voice he told a hard-luck story about himself. But when he was tested he proved to have the makings of a very fine office manager! Mr. O'Connor telephoned the executive who had sent him, told him he had tested the man and, even if it had been only a joke, to him a man's life was no jest, and he demanded that he hire him! The executive had done it as an unthinking prank and felt a little ashamed of himself, so he was a good sport and gave the man a job—in the basement of the building, however, so that no one would see him coming or going! But the first pay check worked wonders and the man turned up in a new suit of clothes and with an enormously increased air of clean respectability. Four years later this man became office manager for the company!

This is admittedly a very unusual story—probably not many bums could be tested and turned into successful businessmen, but it does show that a scientific appraisal of human capabilities may make the difference between success and failure. This man had been unemployed for a long time, and, as a result, he had practically given up hope. The lucky break of getting an unexpected job and the possibility of a brighter future revived his hope and he became once more a respectable and productive citizen. The educational implication of the story is, of course, that good vocational guidance should help to prevent such vocational maladjustment in the first place.

Numerous other factors, such as size, appearance, manner of dress, physical strength and stamina, character, age, sex, economic status, and family connections may be important in particular cases in determining probable success in a vocation and will be considered by careful counselors in appraising an individual's fitness for a particular vocation. However, we shall not attempt to discuss such factors here.

The final aspect of vocational guidance to be considered here is assistance in obtaining a job. Group guidance can be given in methods of locating jobs, in techniques and methods of filing appli-

cations, and in preparation for and behavior during interviews. Students should be acquainted with reputable employment agencies and with other sources of information about vacancies. They should be ready to supply detailed and accurate information about their past education and experience. They should have secured permission from those individuals whose names they wish to use as references, and they should be prepared to give these names accurately with addresses. They should be psychologically prepared to take any required tests. Individual counseling will, of course, be necessary in order to meet individual problems.

Educational Guidance.—All good teaching involves educational guidance, but additional educational guidance may be needed in three special areas: (1) selection of programs and courses, (2) meeting difficulties in current courses, and (3) selection of schools for further training.

In high schools and colleges in which there is some freedom of election, students will need information and advice as a basis of making intelligent choices between different courses. When a probable vocation has not been selected and when the student has not determined whether or not he will go to college, guidance will be needed to help reach wise decisions on these questions. At the college level, students are very often required to select a major field in which they are required to concentrate during the junior and senior years, and in some cases these choices must be made, tentatively at least, before the student has had a course in the subject.

In such cases the Gregory Academic Interest Inventory may prove useful in determining more accurately the pattern of the student's academic interests. This provides interest scores for 28 different subject areas and includes most of the subjects taught in high schools and colleges. It does not measure aptitude, however, and that must be determined from other evidence. A sample profile is shown in Figure 41.

When a vocation has been tentatively selected, or when a student has planned to enter a particular college, the first problem is to plan the high school course in accordance with such aims. In

some cases students will be unwilling to take courses that are necessary as a basis for future work, and this will call for special effort on the part of the counselor to explain the need for such training and to attempt to motivate the student to undertake it.

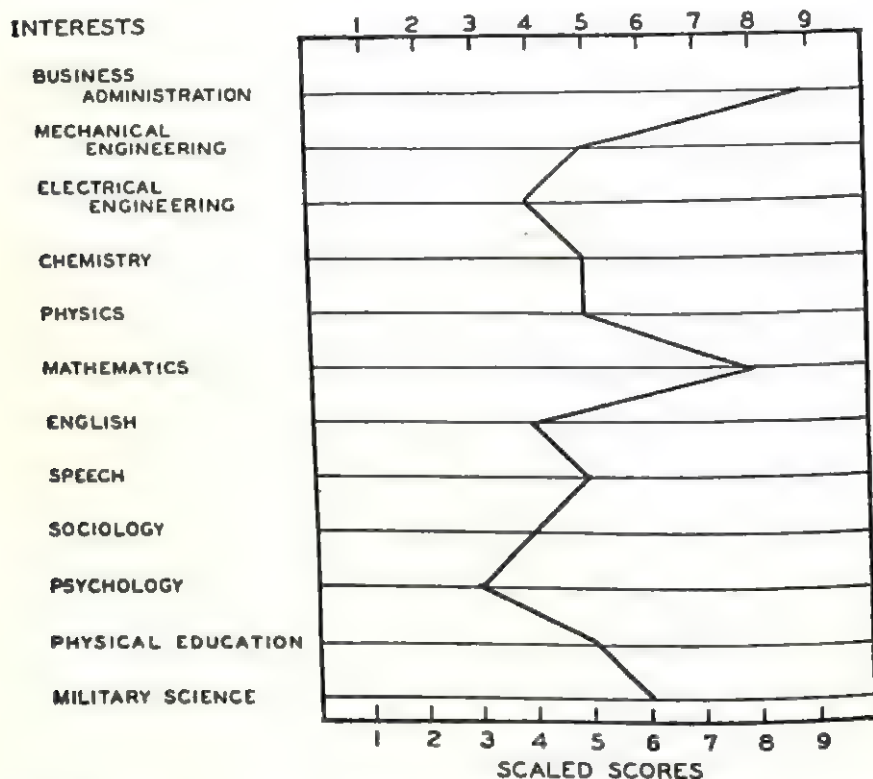


FIG. 41.—Interest Profile for a college man on the Gregory Academic Interest Inventory. This inventory can be scored for a total of 28 fields of interest, but in this case only 12 scores are represented.

In addition there are requirements for graduation that must be considered and, beyond this, is the problem of general educational needs. Too often counselors, who are also teachers, exert undue efforts to persuade students to take courses in their own field. This obviously is taking an unfair advantage of the student. The writer once asked a group of students who were preparing to teach in four-year high schools to indicate how much of their subject should be required of all students. When these suggested requirements were

added together they amounted to about eight years of work! This made it clear to the group that each individual tended to place undue emphasis on his own subject. Counselors should be conscious of this fact and should strive for objectivity and should base advice on the welfare of the student.

When a student has not already selected a vocation, courses should be advised that will probably contribute to a clearer understanding of the student's abilities and interests. For example, a student who thought he might like to go into medicine was advised to take courses in chemistry and in biology. The counselor doubted the student's ability in this field but judged it best to permit the student to arrive at his own decision on the basis of actual experience. This student found the courses both too difficult and too disagreeable and, consequently, he was happy to abandon all thought of becoming a physician. In another case, a student who had the same problem took similar courses and became so interested and was so successful that he went to medical school, took the M.D. degree, and is now a successful physician. In both cases, educational guidance paved the way for more intelligent vocational choice.

This is one of the values of survey courses. They introduce a student to a field and permit him to form a more accurate judgment about both his interests and his abilities.

When a student is uncertain as to his choice between two quite different vocations, it is frequently possible to plan an educational program that will include preliminary training for both vocations and will make it possible to postpone the final decision until the student has had more background and thus can decide with greater assurance. One very successful college biology teacher, for example, prepared in college for law school, but he also took much work in biology, with the result that a month from his graduation date he decided on a career as a teacher of biology. It is not especially exceptional for a student to shift his interest after he graduates from college. As a general principle in dealing with such cases in high school and in college, it is better to delay final decision until a shift in interest solves the problem rather than to force the issue unnecessarily. Even when a student must choose a college major

officially, it is generally possible for him to continue to do work in another field in which he is interested.

In the next place, students will frequently need assistance outside of the classroom in connection with courses they are taking. This may include motivation, correction of individual errors, and suggestions for improving methods of study. General training in study methods can be given to groups, but individual problems will still require individual attention. This will apply especially to students who are not making satisfactory scholastic records, and it may apply also to those whose achievement is notably below their capacity as indicated by intelligence tests.

One of the chief needs for many of these students is to work out a reasonable and definite time distribution sheet to follow in doing their work. The counselor can help both in working this out and in encouraging the student to live up to it.

Another important function of the educational counselor is to anticipate difficulties and to try to prepare for them in advance. It has been found that, if relatively poor students are cautioned at the beginning of a semester that they will need to work hard, they are more likely to do satisfactory work than when they have not been so warned. Also, for those students who are likely to have special troubles with a course, the counselor can help by advising them to get a special tutor at the beginning of the course rather than to wait until they are in difficulties. In more extreme cases, arrangements may be made for a student to audit a course a year before he takes it, or he may do special tutoring in it during the preceding summer.

A third important area for educational counseling and guidance has to do with the selection of schools for further study. High school students will need to make tentative plans about college attendance early in the high school course in order to take the courses required to meet college entrance requirements. It is not very unusual for high school seniors to discover, when it is too late, that they have not met the entrance requirements of the college of their choice. This situation could usually have been avoided by better guidance. High school students also need, not later than the beginning of the senior high school work, to understand quite clearly that

admission to college will probably depend on the quality of work done in high school as well as the courses taken. Obviously, this applies to an even greater degree for college students who are preparing for graduate school. The writer recalls one college senior who had been rejected by several graduate schools, and who urged that future students be warned repeatedly that they must get good grades in order to get into graduate school. He implied that better guidance might have improved his undergraduate record—and perhaps it might have!

There are too many colleges and universities in the United States to expect high school teachers to be familiar with all of them, but teachers can at least be familiar with those institutions to which most of their students go. They can also be familiar with the preparation usually expected for admission to different types of colleges and professional schools. In case of doubt, a teacher should be able to obtain information and to appraise an institution with which he is not familiar.

Guidance for Parents.—Guidance workers are frequently confronted with the fact that parents have a very important influence on the adjustments of their children, and that, as a result, satisfactory guidance for the children may be difficult or impossible without working with the parents themselves. This can be done in large measure through groups such as the Parent-Teacher Associations and the Grade-Mother organizations. It is also good policy to have occasional public meetings to discuss problems of general educational interest. In this way parents can be given a better background for understanding school problems in general and for understanding the problems of their own children in particular.

Workers in the field of sex education, for example, have found that material, including films, should be presented to groups of parents and approved by them before being used in the schools. Parents who know that a program or policy has been approved by a great majority of parents are much less likely to oppose it than if it is started without such prior endorsement.

Parents not infrequently have vocational and educational goals for their children that are based on their own—perhaps frustrated—

ambitions. In such cases, considerable effort may be necessary to obtain parental cooperation in a program that is better adapted to a child's interests. Of course, when personality maladjustments in children are largely based on difficulties in the home, the degree of success achieved in dealing with the problem may depend very largely on the development of better personality adjustment in the parents themselves.

QUESTIONS AND EXERCISES

1. What is the psychological basis of the guidance movement?
2. What is the industrial basis of the need for vocational guidance?
3. What qualifications are desirable in guidance workers?
4. What are some of the chief difficulties involved in helping a student choose a vocation?
5. Compare the relative merits and demerits of directive as opposed to nondirective counseling.
6. What is the practical significance of the correlations found between abilities, interests, and levels of aspiration?
7. When a student's interests and abilities lie in different directions, what would you recommend?
8. How would you deal with a situation in which a boy's parents wish him to enter a vocation for which he lacks either capacity or interest?
9. Why is individual counseling usually necessary in addition to group guidance?
10. To what extent is it reasonable to expect school counseling and guidance to solve the problems of pupils?
11. How do you explain the fact that it is usually helpful simply to discuss a student's emotional problems with him?
12. Why do students so often make changes in their choices of vocations?
13. Why do many vocational counselors prefer to begin with a consideration of a student's interests rather than his capacities?
14. Analyze the interests of the student whose interest profile appears in Figure 40, and suggest vocations that should prove interesting.
15. Suggest practical steps for extending guidance to include parents.

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CHAPTER 17

PSYCHOLOGICAL PRINCIPLES APPLIED TO DISCIPLINE

The word "discipline" is from the same root as the word "disciple," which originally meant pupil. The pupil is a learner, and we frequently use the word "discipline" to mean learning or training. Formal discipline means formal training. The disciplined mind is the trained mind. But we also think of the disciplined mind as the controlled mind. This connotation is understood when we refer to a disciplined army. Such an army is both trained and under control. In this sense undisciplined means uncontrolled. In the natural course of events, uncontrolled individuals get into difficulties, and as a result they may receive punishment because of their behavior. Because of this fact, discipline is likely to be thought of more in connection with reproof and punishment than in connection with learning and control. As Miller¹⁷ points out, the average teacher tends to avoid the word "discipline" because of its generally unpleasant associations. This is unfortunate because the problem is fundamentally a problem of training and control. The punishment angle is incidental. Since all education involves learning and training, all education is discipline in that sense, and consequently the rules of teaching and learning are the rules of discipline.

Control, as used in connection with discipline, is likely to be understood to mean that one person is under the control of another person. However, we also speak frequently of self-control and we may think of the uncontrolled person as lacking ability to control himself. He is impetuous and unpredictable. He acts without much reflection or consideration for the circumstances. As we study the question of discipline we shall see that self-control receives more emphasis and outside control receives less.

The self-control aspect of discipline links the problem to that of character. The man or woman of good character is a controlled,

predictable individual with good habits and can be counted on to act with due consideration for the rights and welfare of others. The bad character either lacks self-control, or, if he has self-control, he is not much influenced by the wishes and attitudes of society as a whole.

The philosopher Fichte once said that the aim of the state is to make itself unnecessary. Lindahl¹⁵ expresses the same idea by saying that our educational goal should be the development of self-control so that authoritative control will not be necessary. This obviously is more than we can achieve in a short period of time: it is rather a goal for us to work toward in all of our teaching.

Historical Background.—In order to understand the problem of discipline as it is met today we need to review briefly some aspects of the developments that have led to current ideas and practices.

In colonial times in the more established settlements, the adult was subject to rather rigid control by the state and the church. The child was subject to additional rigid control by the home and the school. This was true especially of the Puritans, but it was also true of other groups to a lesser degree. Severe punishments were meted out for minor offenses. Since that time, however, the controls have tended to be relaxed. This has been true particularly during the past quarter of a century.

This movement is related closely to the political movement from autocratic and monarchical government to democratic government. The American Revolution and the French Revolution both grew out of the same intellectual revolt against authority. Our forefathers boldly announced that all men are created free and equal. The French adopted the motto, "Liberty, equality and fraternity." The common man was to be free from authoritative control by any "royal" power. This is, of course, an almost inevitable psychological concomitant of any popular revolution. The same type of reaction was found in the Russian Revolution, and when Mussolini, the erstwhile dictator, was finally caught and shot, the mob expressed their resentment by hanging him by the heels as a public exhibition.

It should not be surprising that in due course this movement affected the training of children. Theorists arose who demanded that children also be released from authoritative control.

As a matter of fact, one of the pioneers in this revolutionary movement, Jean Jacques Rousseau (1712-1784), in the *Emile*, advocated bringing up a child without the control of adult authority. Rousseau believed that, if the child was let alone, he would naturally grow up to be a commendable citizen, while if he was subjected to authoritative control by adults he would be corrupted.

Something of Rousseau's viewpoint is shared by the current movement in Progressive Education. Progressives do not agree among themselves—which is to be expected in a new movement—but, as a group, they tend to favor freedom for the child to follow his natural inclinations rather than to follow a pattern prescribed by adult authority. This means that the Progressive ideal of discipline is far removed from the previous authoritative conception.

This conflict is related to and grows out of two contrasting views of human nature. Puritans and others of similar views held that man was born in sin, that he was naturally perverse, and, if allowed to grow up without rigid control, he would become a menace to himself and to society. If, therefore, the child was to become a civilized and Christian adult, he must be given severe training. This group relied heavily on the Biblical maxim, "Spare the rod and spoil the child." Thrashing was used at times even to stimulate low mental capacity. Boys who did not, and at times could not, learn their lessons were repeatedly thrashed.

The rival group of thinkers, sometimes called the Romanticists, believed man, and hence the child, to be naturally good. For them, evil resulted from the bad habits and perversity acquired by adults. Besides, control was bad in itself. Free and unrestrained activity was necessary for the full development of inner tendencies. This belief led naturally to the educational philosophy that we should provide children with opportunities for expression and should permit this expression with a minimum of restraint. Education must not be considered as a preparation for adult living. The important thing is simply to live and develop naturally.

According to this belief, no child is naturally bad. If he is guilty of conduct which, according to adult standards, is bad, it is simply because his environment or his training has been of the wrong kind. Society is fundamentally responsible for all bad behavior. From these premises it follows more or less logically that punishment is improper and is likely to make the offender even worse. They reason that since all children are inherently sweet and rational, we must appeal to this sweetness and rationality if it seems necessary to correct the effects of previous bad environment.

The Romanticists have supported their position by adopting some, and rejecting some, ideas advanced by the psychoanalysts. Freud and his followers have told us that inhibition and suppression may lead to conflicts and complexes, to inferiority feelings, to introvert personalities, to poor social adjustment, and to bad mental hygiene in general. Also, bad mental hygiene may interfere with proper physical growth and development, as has been recently emphasized by studies in the field of psychosomatic medicine. On this basis, it is argued that, if adult control is imposed on the child, it may ruin his personality and make him a failure as an adult, or, worse yet, it may make him a perverted psychopath, or a criminal, or a suicide. In order, therefore, to develop the desired extroverted and socially well-adjusted personality, inhibition and suppression must be avoided. On this basis stern parents may be expected to have rebellious children. Strict discipline in any form or area produces rebellion against authority. Authority, discipline, and punishment come to be held responsible for a major part of misbehavior.

At about the same time that the psychoanalytic movement was developing, a parallel and related idea emerged from a different source. This was the doctrine of interest as a factor in education. Previously parents and schoolmasters, churchmen and statesmen, decided from the depths of their wisdom and experience what was good for the child, then offered it to him, and it was just too bad for him if he did not absorb the offering readily and effectively. It frequently happened, though, that these adult offerings were not satisfactorily assimilated. It began to appear that the attitude of the learner was an important factor in the learning situation. This

principle was emphasized particularly by John Dewey and his followers. Out of this developed the idea that in order to make learning easy and effective the material taught must be closely related to the natural interests of the child. This conclusion takes us back again to Rousseau and is in line with the interpretation of psychoanalysis as stated previously.

Emphasis on catering to the interests of children leads naturally to the idea that there should be as much freedom in education as possible. The child is not to be forced to do something he does not wish to do. If he is permitted to follow his own inclinations, this will, in theory at least, eliminate much of the need for discipline and control.

Those who favor catering to the interests of children have been supported by modern psychological studies of the transfer of training. Before 1900 the doctrine of formal discipline was commonly accepted by educators. According to this doctrine the mind consisted of a group of faculties which could be sharpened and improved by the study of appropriate subjects. Reasoning could be improved by the study of geometry, memory by the study of Latin, and so on. If the subject was difficult and disagreeable, so much the better; character was to be formed by developing self-mastery in doing disagreeable things. Hence the ideal curriculum was one that would require teachers to use considerable pressure to force children to master it.

As a result, however, of the experiments by James, Thorndike, Woodworth, and many others, the doctrine of formal discipline was discredited and was replaced by the modern theory of transfer of training. According to this there is no general improvement of faculties: rather there is the learning of particular facts, principles, attitudes and skills, which will be used, or transferred to life situations, in proportion as they are related to environmental needs and in proportion to the intelligence and resourcefulness and interest and effort of the possible user. Distaste for a subject leads to avoiding it and forgetting it. Hence if we are to get maximum transfer we must cater to student interests and needs. Instead, therefore, of using pressure to force children to study material they do not like, we

attempt to arouse their interest and enthusiasm for the subject. Or, preferably, we study the interests of children and make a curriculum to satisfy those interests. Instead of thrashing the boy to force him to learn something he doesn't care for, we try to make him glad to learn something because he feels that he needs it. This not only changes the curriculum, as we have seen in Chapter 3, but it also affects vitally the problem of discipline. When we came to talk about the "child centered school" we also relaxed adult control of child behavior. Hence, although the theory of transfer of training was primarily a theory of intellectual learning, it tended to change the school situation with respect to the maintenance of order and discipline.

The problem of freedom versus control has recently been accentuated in the political sphere by the rise of dictatorships in various countries, by the impact of World War II, by the publicity given to the "four freedoms," by the struggle of various colonies to escape from imperial control, and by the publicity given to the American system of free enterprise as opposed to the totalitarian systems of other countries.

Since we mentioned the psychoanalytic emphasis on the dangers of inhibition and suppression, it seems necessary in the interest of fairness to add a further idea. Freud held that inhibition has its dangers, but he also held that inhibition is the basis of civilization. If primitive human urges were permitted free play without legal or other social restraints, might would become right, and murder, rape, and all the other crimes would become commonplace. Anarchy and savagery would replace civilization. Social taboos, customs, conventions, and laws are necessary to restrain our natural, selfish individualism. The individual must be inhibited and repressed as the price of living in peace with his fellows. If any man insists on being free from this inhibition and suppression, his only recourse is to retire to a jungle or to an inaccessible mountain retreat and live as a solitary hermit.

Social control is common even among the lower animals. Wild geese follow a leader when on a flight. Insects have a degree of social organization and will drive off intruders who enter their domain. The ideal of complete freedom is thus incompatible with social or-

ganization throughout the animal scale. The question, consequently, is not whether we shall have discipline or not; it is rather as to the aim of discipline, and as to the amount, the source, and the procedures to be used to bring it about.

Some Contemporary Ideas.—The Educational Policies Commission of the National Education Association and the American Association of School Administrators, after spending several years studying the problem, has approved this statement by one of its members, Dr. George S. Counts⁵ (pp. 75 and 76):

The democratic faith is sustained and fulfilled by the discipline of free men. Loyalties and knowledge are not enough. Without discipline, loyalties, however deep and abiding, can avail but little; without discipline, knowledge, however precise and comprehensive, must remain ineffectual and sterile. It is in this domain, say the apostles of contemporary dictatorship, that the Achilles' heel of free society is to be found. It is here, say the friends of despotism in all ages, that the fatal weakness of democracy resides—a weakness that is certain to impair its moral vigor in times of calm and paralyze its power of action in times of storm. To the champions of authoritarian rule discipline and liberty are contradictory terms. . . .

Discipline is an essential ingredient of all effective action, of all purposeful behavior. To refuse to deal adequately and unequivocally with this problem is to insure defeat and disaster. . . .

Discipline means the putting of loyalties and knowledge to efficient use, the ordering of life in the light of understanding and toward the attainment of purpose. It involves the subordination of the near to the remote, of the present to the future, of the lesser to the greater good. It involves the restraint of the impulse of the moment, the regulation of desire, the postponement of satisfaction, the sacrifice of immediate comforts and pleasures, the choice of the harder way when the easier way is open. Discipline is never indulgent; it may be rigorously exacting. But it assumes this severe form, not because there is virtue in severity, but rather because such is the condition of achievement.

The crucial role of discipline in the life of the individual is evident on all sides. Even the most modest success, whatever the standards of judgment, requires labor and sacrifice, the restraint of impulse, and the intelligent coordination and direction

of energies towards some chosen goal. Whether the goal is good or bad from the standpoint of a given set of moral values, whether it calls for service to or exploitation of one's fellow men, whether it is the building of a doll-house, the winning of an athletic contest, the robbing of a hen-coop, the amassing of a fortune, the organization of a band of criminals, the becoming of a good farmer or carpenter, the cultivation of love or friendship, the defeat of an enemy, the attainment of a political office, or the achievement of eminence in the arts or the sciences, an appropriate discipline is absolutely essential. In advancing towards any goal, even the most nefarious, more or less rigorous self-denial is required."

This general position is supported by numerous other writers, and a few of these are listed in the references at the end of this chapter.^{2,8,12,18,14}

From the foregoing it seems clear that discipline is necessary and that under some conditions the discipline will need to be rigorous. A little reflection will add the vital point that effective self-discipline or self-control is a most important mark of emotional maturity. Only the mature, self-controlled individual is capable of deliberately postponing satisfaction and of cheerfully accepting present discomfort and inconvenience in order to gain remote goals. The child is more subject to the whim and the pleasure of the moment.

This is closely related to the distinction we make psychologically between work and play. We play for immediate enjoyment; we work to attain remote goals. Work is more characteristic of adults, while play is more characteristic of children.

Our goal in the disciplinary training of children is the development of socialized self-control by the individual: if he is to be well adjusted to his social environment he must control his behavior so that it shows due consideration for the welfare of the rest of the community. However, when we start to train the young child, this is a remote goal and cannot be attained in a short time. Its attainment will, at best, be a gradual process: we do not have the child today and the adult tomorrow. This implies that, at first, such control as is exercised must be adult control. Our effort, however, should be gradually to train the child in self-control, and, as this

self-control develops, we should progressively relax adult supervision. In other words, we should give, and should desire to give, the child as much freedom as he is able to use properly, but no more.

To advocate that the child be entirely free from restraint and that he be protected from responsibility is to advocate that we keep him in an infantile emotional condition. This would do him a most serious disservice in that it would delay and might prevent development into a responsible adulthood. The spoiled child may temporarily be no more than a nuisance, but the spoiled adult is headed for difficulties in employment, in marriage, and in other social relationships as well as in the execution of his private enterprises.

Parental control may be, and often is, very largely escaped either because the parent makes no effort at control or because the measures used are ineffective. Similarly, teacher control may be relaxed to the point where it amounts to little. But there are two types of controlling forces from which the child will not be permitted to escape: these are nature and society. Natural laws cannot be evaded. Neither the headstrong, nor the psychopathic, nor the spoiled child can escape them or successfully defy them. Those who would succeed in dealing with nature must learn the rules of the game and must obey them or pay the penalty. Similarly in dealing with society at large. The spoiled child will, in due course, meet other spoiled children as well as other individuals who have definite ideas about proper behavior. Also, a large proportion of our school children will eventually become members of business establishments that are conducted on the basis of definite authority and discipline. Then there is the state with its laws enforced by police officers and judges, some of whom are interested in obtaining a monthly quota of convictions.

Success in coping with these social realities will depend on learning and following a set of requirements. In this sense no child and no adult can completely escape an exacting discipline. Certainly one of the aims in the training of children is to develop a cheerful acceptance of the requirements for successful living.

Rightly or wrongly, there is a strong consensus that lack of proper adult supervision is one of the most potent factors in the development of juvenile delinquency. In a study of two thousand

juvenile delinquents, Healy and Bronner¹¹ found poor home conditions and lack of parental supervision to be the most important single factor associated with delinquency. Furthermore, the adult criminal is a criminal because he defies social mores and standards of conduct; and almost invariably he began this defiance before he had reached adulthood.

There is a further consensus that the easiest time to develop control over the child is when he is young and that as he gets older it will become increasingly more difficult to change his pattern of behavior. Most young children accept reasonable control as a matter of course, but, if it is too long delayed, they may permanently resist it.

There is a contrast here between the effect of growth on the capacity to learn intellectual things and on the capacity to change emotional attitudes and patterns of response. Intellectual learning capacity grows with age to maturity. A man or woman might be illiterate at the age of twenty and still acquire an excellent intellectual education. Even in senescence, ignorance can be overcome, new knowledge can be gained, and false ideas can be corrected. But, in contrast to this, bad emotional attitudes and habits in adults have not been found to respond so readily to training. Some juvenile delinquents have been reformed, but the size of our adult criminal population is more than sufficient proof that in many other cases the juvenile delinquent has gone on to become the hardened criminal. In many cases this happens in spite of the best efforts of our most enlightened reform schools and other social agencies. However, even if in all cases juvenile delinquents could be and were reformed, we would hardly regard that as an ideal approach to responsible adulthood. It seems, therefore, that the disciplinary training in the early years of infancy and childhood is most important and that, if this is properly done, the difficulties of discipline will decrease progressively with growth. It is the responsibility of the parent and of the teacher to supply such supervision and control as may be needed until the child is able to take over on his own account.

The development of wholesome personality and good character is rightly emphasized as a major goal of education, and the success of the school in attaining these goals will depend very largely on its

success in solving the problem of discipline. Improper or ineffective disciplinary methods may be injurious both to personality and character. It is generally accepted that brutal and repressive methods are objectionable; it is less frequently recognized that laxity in discipline may be equally ineffective in promoting the development of socially desirable personality adjustments and character. In this, as in so many other things, the ideal is suggested by the Aristotelian doctrine of the golden mean: we must find an acceptable middle ground.

THE NATURE OF BEHAVIOR AND BEHAVIOR ADJUSTMENTS

School discipline attempts to control and modify behavior, and for this reason we need a good understanding of behavior in general as a background for understanding the problem of discipline. More specifically, difficulties in behavior may be the outgrowth of almost anything in the total situation in which the child finds himself. Thus, disciplinary difficulties may grow out of infected teeth or tonsils, or defective vision or hearing, or misplaced vertebrae, or an overtaxed heart, or malnutrition, or physical deformities, or bad home conditions, or difficulties with the "gang," or disappointments in attaining any desired objective. This means that the problem of discipline touches the entire life of the child. Consequently, in order to encourage "correct" behavior we need to make the child's total environment correct. When bad behavior occurs we need as far as possible to take into account and to adjust any and all underlying conditions that may be responsible. We cannot, of course, hope to be completely successful in this effort, but we can at least do as much as circumstances permit.

It will be useful at this point to review certain facts about child development. This is especially necessary if we are to make allowances for the differences in children at different ages.

For some time after birth the infant is little more than a reflex organism. The higher centers of the brain have not developed to the point where they can function. Yet even the new-born infant is capable of learning within limits on a conditioned response basis, and this implies that he is subject to disciplinary measures. He can

be spoiled and made into a bad baby who keeps his parents awake in the small hours of the night or he can be trained properly and be a good citizen.

Bad behavior in infants generally grows out of physical discomfort. Hunger, cold, pain, or other sources of irritation, will lead to vocal outbursts. However, proper physical care will, in large measure, reduce the causes for such outbursts and consequently it is the most important first step in controlling behavior.

As stated previously, the learning of infants is largely of the conditioned response type and develops in accordance with the laws of exercise and effect. If the child is picked up and soothed when he cries, or if he is petted when he sustains a minor hurt and cries, he will soon learn that vocal outbursts are rewarded. Under these conditions crying may be expected to become a troublesome bad habit and may pass over into whining and sulking as the child grows older. Bean¹ supplies the following story: "A little girl said to her mother, 'If Daddy still refuses to buy you that fur coat, do like I do, throw yourself on the floor and kick and scream, and he will give in.'" If, however, parents are wise enough not to reward undesirable behavior the child will soon learn its futility and will cry much less.

As the child grows older he develops new urges and drives and becomes aware of his social environment. For our purposes, the most important aspect of this development is that he becomes responsive to social praise and blame. On the basis of the law of effect, praise encourages him to repeat an action while blame tends to discourage him. For the rest of his life he will be influenced by the attitudes of those around him. This, then, introduces a new source of control. It is not only a new source, it is a higher and more desirable source.

At first this motive is weak. Mamma's scolding, if not reinforced by something more primitive, may not be sufficient to deter little Jimmie from making a raid on the cookie jar. With age, however, this impulse normally becomes stronger until adults may risk life and limb to win approval and fame. However, juvenile delinquents and criminals may be but little affected by general social disapproval if they retain the esteem of their kind. In the early

grades, the naughty child may not be too much depressed by the disapproval of the teacher if his classmates do not join with the teacher. Sensitiveness to the approval or disapproval of one's own kind usually remains stronger than sensitiveness to public opinion in general.

For this reason it is most important for the teacher to win group support as far as possible. When the group favors a proposition, very few individuals will dare to oppose it. This seems to be especially true at the ages from about ten to fifteen. During this period children tend to become critical of adults in general and of parents and teachers in particular and if the teacher cannot get the support of the group, it will be harder to develop satisfactory disciplinary conditions.

During the period of adolescence in normal and superior children, but not in the subnormal, intelligence develops to the level at which abstractions and generalizations are understood much better than earlier. This supplies the intellectual basis for the highest level of behavior in which conduct is regulated by general principles and abstract ideals. At this level it becomes possible for the individual to resist public opinion and to support ideas that he believes to be right or to promote measures he believes to be for the public welfare even though the majority of the public opposes. Social leaders and reformers must, in general, be motivated largely in this way or they would not try so hard to change existing conditions.

When a person reaches this level, he substitutes loyalty to principles for loyalty to party or to persons. He may even substitute loyalty to the welfare of mankind in general for loyalty to his own country. In World War II, for example, some Germans, believing Germany to be in the wrong, believed it for the best interests of mankind for Germany to lose the war and consequently they joined the enemy. This was treason to the existing German government, but, in some cases at least, it represented the highest type of ethical action.

When a person reaches this level of conduct he is less likely to subscribe to such mottoes as "My country right or wrong" and he is less likely to show unquestioning loyalty to individual human leaders. The German soldier who had reached this level of develop-

ment might have been more than reluctant to die for his Fuehrer. For this reason those leaders who ask for unlimited power and unquestioning personal loyalty will find their best followers among the intellectually and ethically subnormal. Young children are capable of such loyalty, but with the coming of adolescence, normal and superior children are less likely to accept the individual man as perfect.

The implications of the foregoing remarks for discipline are of the utmost importance. In the first place, our goal should be to develop each individual as far as his intellectual capacity and his emotional makeup will permit in the direction of devotion to abstract ideals and general principles of conduct. This means devotion to right, truth, justice, love, charity, and human welfare instead of devotion to particular political leaders, parties, and other units of a lower order.

In proportion as we succeed in this endeavor we shall, of course, find that these individuals are less willing to submit to arbitrary control. They will want to understand what they are doing and why, and they will no longer accept the idea that Father or Teacher knows all the right answers.

At this highest level we should appeal to understanding, to sense of justice, fairness, sympathy, and similar emotions. But we need to remember that these highest level feelings are likely to be undeveloped in many individuals and to be relatively weak in most of those who do have them. For this reason appeals to public opinion, "What will people say?" will still have great force. The most idealistic philosopher not only has a high regard for public opinion but he also remains sensitive to the impact of physical pains, discomforts, and gratifications. In short, those who rise to the highest level of conduct do not leave the lower levels behind: they simply add some higher, and probably usually weaker, motives.

Hence, although we should appeal to the highest motives as far as possible, we should face the fact that very frequently they will not work. Appeals to public opinion will affect most adults and most children, but in some cases these appeals will fail. In some cases appeals to brute force will work when appeals to public opinion will not work, and in some cases nothing seems to work.

Some theorists profess to believe that successful discipline is possible at all levels by appeals to reason, understanding, and generous human motives, but such faith does not agree with what we know about individual differences and about development. If we are to deal successfully with young children it will, at times, be necessary to use low-level disciplinary controls just as it is necessary to use low-level controls in dealing with animals.

Consider this case: A young mule is being trained to carry a rider. After being a good mule at first, on the third lesson he suddenly starts bucking, the saddle girth breaks, and saddle and rider go to the ground. The mule turns on the rider and kicks him and tries to trample him. The rider escapes minus his shirt but without serious injury. The mule is given a dose of corporal punishment and never bucks again. It is, of course, possible that kindness might have achieved the same result, but those who have had experience with mules will be disposed to question the efficacy of gentleness in such cases. Successful lion trainers generally use a pistol and a whip, and there is good reason to doubt that they would be successful without this equipment.

No competent psychologist or educator recommends the free and indiscriminate use of corporal punishment after the fashion of a century ago, but it does appear to be a desirable alternative in some of the worst cases.

In the Whittier (California) State School, which is a reform school, two teen-age boys hanged themselves. After this, Chester Lee White, an educator with fifteen years of successful experience in dealing with maladjusted youths, took a summer position as supervisor in the Discipline (Lost Privilege) Cottage where the worst cases were confined. His opinions, after experience with this group, are worthy of consideration²² (p. 47):

Instead of effective discipline, the usual penalty for the most serious disregard of rules is a mark of zero entered on the daily report card.

I was amused by the story of a baffled supervisor who appeared before his superior officer seeking advice. He complained that, although he had given a certain boy triple zero for the day, the boy still insisted on calling him a so-and-so. The supervisor

wanted to know what he should do about the matter. The humor in the story is that there was nothing effective that he might do, and he should have known it. Of course he might have given him another zero—on the theory that when you try, try again, you may succeed. . . .

If it takes a cuff to change a child's mind about his responsibilities to society, the state has not acted wisely if that cuff has been postponed until the child has reached the reformatory. Certainly the law should not charge the authorities of a state school with maintaining order, and then shackle them by making the use of corporal punishment illegal. Everyone who has been on the receiving end of this baffling business recognizes that it is sometimes necessary and advisable.

There is no reason to believe that corporal punishment would always work where other measures have failed, but there is good reason to believe that it would work in some cases in which the only practical alternatives are imprisonment or execution.

As idealists we should always try to use the highest form of disciplinary control possible. Appeal to reason, understanding, altruism, sympathy, loyalty, etc., if there is any reasonable hope that these will succeed. If these do not work, we should try the lower appeals to public opinion, praise and blame. If these fail, we shall have to try still lower appeals. If all of these fail, the State may make the ultimate confession of failure by resorting to the electric chair.

In relation to age, this conclusion implies that the older the child and the more mature he is emotionally, the less legitimate occasion we shall have to use lower forms of disciplinary measures. However, in dealing with very young children, appeals to abstractions and ideals are futile, for, before about the age of twelve years, neither intellectual nor emotional maturation is likely to be adequate to justify high-level appeals.

FACTORS IN DISCIPLINE

Our principal efforts in connection with the training of children should always be positive and constructive, and, in proportion as we succeed in this effort, we shall find it unnecessary to resort to

negative and punitive measures. For that reason the teacher who is the best disciplinarian is the least troubled by disciplinary problems because the possible and probable sources of trouble have been foreseen and very largely eliminated. With this in mind, we should first ask: What are the conditions favorable to good discipline? What conditions need to be avoided because they are likely sources of trouble?

The physical environment is an important factor, though not always under the teacher's control. Overcrowded classrooms, poor light, heat, and ventilation and improper desks and equipment are possible sources of fatigue and irritation and should be corrected as far as possible. Good working conditions are important in schools as well as in offices and factories.

The curriculum is another possible source of trouble that may be, in large measure, beyond the teacher's control. Many pupils have been required to take subjects that were beyond their intellectual capacity and for which they could see no personal use. In such cases it may be all but impossible for the individual teacher to meet their reasonable objections. This problem, however, is not met in the early grades so much as in some high schools and colleges. When it is met, it will probably help if the teacher makes it clear to the students that she did not make the requirement, but that she will do her best to help the students meet it.

Unfortunate counseling, guidance, and classification of students frequently gets students into courses for which they are not fitted either because of lack of capacity, lack of interest, or lack of preparation. Here the alert teacher may, in many cases, either obtain a change in classification, develop interest, or assist the student in correcting deficiencies in previous preparation. When individualized methods of instruction are used, this will be less difficult than when class methods are used. For this reason, teaching procedures as well as curricular content or errors in classification may be a factor in disciplinary problems.

The most important source of good order in the school is to have every individual pupil or student fully engaged in some enterprise that he is able to understand and which he believes to be worth mastering. Class instruction with groups that are not very homo-

geneous will, at times, be a source of difficulty. If the teacher takes the time necessary to clear up some points for the poorer students, the brighter ones will be bored and may be ready to seek other entertainment. If an excursion is made into more difficult topics, the weaker students may lose interest and cause trouble. However, even with class instruction, variations in individual requirements are usually possible, and the teacher who is aware of this source of trouble can at least minimize the difficulty, even though it cannot be entirely avoided.

At times the judicious seating of students will help to prevent difficulties. Naughty boys in the back row are more likely to get into mischief than if they are in the front of the room. On examinations, if poor students are seated together near the front of the room they will be less likely to try to copy the work of their neighbors.

Temptation on tests and examinations can be reduced by having all texts and notebooks left outside the room or placed in some spot under the eye of the teacher. Even at the college level, unless an honor system prevails, close supervision may be necessary to prevent dishonesty, and the instructor who does not give this supervision may be encouraging dishonesty. The alert teacher who faces the problem can usually do a great deal to remove temptation.

The teacher's relation to the class is one of the most important sources of good or bad discipline. The ideal teacher is friendly and shows interest in the students and their problems but is not too familiar. Some dignity and reserve are necessary for the best results.

Lower animals, children, and adults are much alike in that when several come together there arises a problem of social domination. Pupils and students will try out the new teacher: either the teacher will dominate the situation and lead or the pupils will dominate and the teacher is in for trouble. Some personal force and leadership are necessary, therefore, for successful teaching and discipline. One brilliant young teacher lost her first battle with a junior high school class and was forced to quit her position within two months of the beginning of the year. This aroused her wrath and determination; she was given a second try, and won the battle. She became an excellent teacher.

This factor may make the life of substitute teachers a hard one if they lack the ability to command the situation readily or if they go to rooms where discipline has been bad. One substitute had such a rough time of it in her few days as a substitute that she took the position permanently with the determination to dominate the situation. Curiously enough, those pupils and students of all ages who try hardest to "break" the teacher seem to have the greatest amount of respect for those teachers who refuse to be broken.

It goes without saying that the teacher must have a strong sense of justice and fairness and must not play favorites. Failure at this point will cost the teacher the respect and good will of the class and, when these are lost, really satisfactory discipline becomes impossible.

The teacher should be the accepted leader of the group but should minimize the role of dictator. As far as practicable, the group should understand what they are about, and democratic group support should be developed. Even when courses and tests are required, there are many little matters that can be left to the group to decide and, if this is done, it will promote a much better feeling toward the course and the teacher with the result that class morale will be better and deviations from desirable behavior will be less frequent. Moreover, when they do occur, the class is more likely to turn its collective wrath against the offender.

If we believe in democracy, it seems logical that we should believe in as much democracy for children as can be made to work successfully. Student self-government is a desirable ideal, but it is difficult to attain. The best practical advice would seem to be to have as much self-government as can be made to work effectively, but no more.

THE TREATMENT OF BEHAVIOR PROBLEMS

Since children are not perfect, we cannot reasonably expect that their behavior will be perfect. Misbehavior will present problems with which the teacher must deal. In line with our previous discussion, the teacher needs to analyze the causes of these disorders and, as far as possible, remove them. In the more serious cases

this may be a lengthy and difficult problem and may extend beyond the schoolroom. Strang makes this comment ²¹ (p. 220) :

An increasing number of teachers consider a "bad" case as an opportunity to help an individual correct some personality defect that will interfere with his own happiness and his contribution to society. They discover his reasons for misbehavior, encourage him to find a solution of the problem, and help him to change the conditions that are contributing to his maladjustment.*

A medical examination may be called for in some cases to locate physical causes of difficulty. Maladjustment in the child's home is another possible source of tensions that may interfere with school adjustment. Or the difficulty may be in the school itself. Whatever the causes, they should be discovered and as far as possible corrected. If this is not done, reproof and punishment may be worse than useless. Punishment may simply suppress the external manifestations of the difficulty and leave the child seething internally in a most unhygienic condition mentally.

One of the worst disciplinary cases this writer has encountered at the college level grew out of a love affair which a young man had had and which had met with strong objections from his parents. As a result, a normally amiable young man became for a time a very bad citizen. In such a case the teacher needs to turn mental hygienist rather than disciplinarian.

Fortunately most cases are not so serious. Also in many cases the causes cannot be located and removed and the behavior must be dealt with in other ways.

Campbell made a study of the recommendations of a group of psychological and educational experts and of a group of elementary school teachers as to the relative frequencies with which different kinds of treatment should be used in controlling behavior. These are compared with the frequencies with which these methods are actually used. Her results are given in Table 7. The items are arranged in order according to the recommendations of the experts.

By examining the table it will be seen that Assistance takes first rank among the measures recommended by the experts. In many

*Quoted by permission of the National Society for the Study of Education.

cases it is possible to help a student meet his problems and by helping him to clear up his difficulties the misbehavior may be corrected. Next is the verbal appeal. This is first with the teachers. There is no doubt that this is very frequently used and works well in many cases. Otherwise the teachers and the experts agree fairly well in their recommendations. In actual practice, however, we find that Deprivation, Overtime, and Censure are used much more often than is recommended, while ignoring is used much less often than recommended.

TABLE 7. THE TREATMENT OF CLASSROOM BEHAVIOR PROBLEMS
(ADAPTED FROM CAMPBELL, 3, PP. 24-25 AND 48)

Rank	Treatment	Recommended by 56 Experts		Recommended by Elementary Teachers		Used by Good Teachers	
		No. of Cases	Per Cent	No. of Cases	Per Cent	No. of Cases	Per Cent
1.	Assistance	171	27	29	15	77	15
2.	Verbal appeal	129	20	51	28	84	16
3.	Social approval . . .	124	20	31	17	53	10
4.	Deprivation	85	13	30	16	129	25
5.	Ignoring	48	8	7	4	4	1
6.	Reward through privilege	42	7	10	6	25	5
7.	Overtime	16	2	9	5	41	8
8.	Censure	14	2	12	6	95	19
9.	Physical force	5	1	5	3	6	1

It should be noted that the purely negative punishments are at the bottom of the list, with physical force least often recommended—as we should expect.

In 1935, Strang²¹ found that in 83 elementary schools, physical force was actually used in less than one per cent of the cases, censure in about one half, and deprivation in about one fifth. This indicates that in practice censure is used much more often than it would be defended in theory. This is probably because it is a quick and easy

way of dealing with the problem. However, if used excessively, it tends to create a bad atmosphere and also tends to lower the standing of the teacher with the class as a whole.

Deprivation is strongly recommended in theory and is often used in practice. However, there is some reason for holding that deprivation has worse effects from the standpoint of mental hygiene than some other apparently less detrimental punishments. The reason for this is not clear, but it may well be because it tends to produce maximum frustration and encourages sulking and similar attitudes.

TABLE 8. CORRECTIVE MEASURES USED BY MORE SUCCESSFUL AND BY LESS SUCCESSFUL TEACHERS (FROM CAMPBELL, 3, P. 37)

<i>For the Teachers Rated A in Classroom Control</i>	<i>Total Fre- quency</i>	<i>For the Teachers Rated C— in Classroom Control</i>	<i>Total Fre- quency</i>
Reasoning	58	Scolded	80
Social approval	53	Gave sharp command...	68
Repeated directions	45	Kept in	59
Place changed to another seat	36	Threatened	58
Denied a privilege.....	35	Asked direct question..	53
Scolded	31	Deprived of group ac- tivity	39

Another basis for evaluating the relative merits of different methods of meeting classroom behavior problems is by comparing the procedures actually used by teachers rated as excellent and as inferior in control. Table 8, which is from Campbell³ (p. 37), shows the relative frequencies with which the six most commonly used measures were used by these two groups of teachers. The table shows clearly that the more successful teachers more often resort to reasoning and to positive appeals while the less successful more often resort to scolding and threatening. This means, in effect, that the more successful teachers show more respect for the feelings and the personalities of the offenders and use measures that are less likely to create dislike for the teacher. The poorer teachers more often use measures that tend to develop pupil-teacher antagonism,

and, in that sense, these teachers tend to accentuate their own disciplinary problems.

One of the chief shortcomings of earlier disciplinary practices was that they failed to give proper consideration to the psychological effects of disciplinary measures on the offenders. As we have already noted, Snygg and Combs²⁰ have developed the idea that all voluntary behavior is aimed at the protection and enhancement of the individual's self-esteem. In so far as this is true, it suggests that disciplinary difficulties are likely to arise when a pupil judges that the activities of the school are not contributing to his self-enhancement. Also, from this point of view, the efficiency of disciplinary measures is to be appraised, in part at least, by their effect on the self-esteem of the pupils. This obviously implies the desirability of obtaining results without resorting to measures that tend to humiliate the offender, although there may be occasions when this is not possible.

SOME GENERAL PRINCIPLES

No set rules can be given as to just what treatment or punishment should be used in particular situations. The effectiveness of any procedure will depend largely on the teacher, the class, the individual concerned, and the total situation. For this reason each case should be settled on its merits rather than according to previously made rules. It is possible, however, to suggest a few general principles which may be used as a guide both in determining general policies and in determining what to do in particular cases.

1. Prevention is better than cure. Attempt to remove or to reduce the sources of disciplinary difficulties.
2. The best method of disciplinary control is to keep a group busy at projects that they find interesting and believe to be worth while and in which they can achieve reasonable success.
3. Praise, social approval, rewards, and special privileges are more desirable controls over conduct and are generally more effective than negative measures and punishments. It is more effective to encourage right conduct than it is to discourage wrong conduct.

4. Age differences in children are important in determining treatment. Younger children require lower forms of control.

5. There are important individual differences in children of the same age. Some require more drastic treatment than others.

6. Nervous and sensitive children require special consideration. In general they require little or no punishment. Kindness rather than severity is usually indicated.

7. Use the highest level of control that is effective under the circumstances.

8. Sarcasm is rarely, if ever, justified. It tends to inflict permanent wounds, and hurts the teacher with the rest of the group.

9. Consider the feelings of the rest of the group when dealing with any individual.

10. Avoid nagging. Take definite and effective action and drop the matter.

11. Temper is to be kept under control. However, temper is a social force and on occasion the controlled showing of temper will be effective.

12. Some difficulties are due to personality clashes between the child and the teacher. The best solution for some of these is to transfer the child to another teacher when this is possible.

13. For visiting teachers perhaps the simplest solution in difficult cases is to send malefactors to the principal and let him deal with them. He should know them; the visiting teacher usually does not.

14. After censure or other punishment, drop the matter at once. Do not continue to show evidence of anger and do not carry a grudge against the guilty child.

15. Groups should not be punished for individual misconduct, except possibly in very special cases. Disregard of this rule leads to grave individual injustices.

QUESTIONS AND EXERCISES

1. How have political movements influenced school discipline?
2. Explain the relation between Rousseau's theory of child training and his beliefs about the nature of the child.

3. Compare Rousseau's views with those of the Puritans and with contemporary scientific ideas.
4. How has the modern emphasis on interest influenced theories about discipline?
5. How has the theory of transfer of training affected our ideas about discipline?
6. Why is discipline necessary for achievement both in case of groups and in case of individuals?
7. What are some of the penalties that result from the violation of natural laws?
8. What are some of the results that follow from the failure to conform to social customs and conventions?
9. Why is the disciplinary training of the young child more important than training at later ages?
10. What may we learn from animal experimentation that will be helpful in the training of children?
11. Why is it important for the teacher to develop group support for regulations and disciplinary measures?
12. Why are appeals to higher motives and to understanding frequently ineffective?
13. Summarize the most important causes of poor school discipline and suggest remedies.
14. Why are negative disciplinary measures psychologically less desirable than positive measures?
15. Compare the disciplinary measures used by the best and by the poorest teachers as shown in Table 8.

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CHAPTER 18

THE TEACHING STAFF

Educators often emphasize the idea that our schools should be child-centered or community-centered, but probably no one will question the statement that, to a very great degree, the success of our educational effort depends on the teachers who are responsible for putting the educational program into effect. We may provide adequate buildings and equipment, we may plan excellent courses of study, and we may, by enforcing compulsory attendance laws, secure the attendance of pupils at school; but the educational results obtained will, in the final analysis, depend very largely on the quality and efforts of the teaching staff. Efficiency in education, therefore, requires the services of capable, trained, and experienced teachers.

The Teaching Profession.—The professions are usually understood to include the ministry, law, medicine, and teaching. In the first three of these the great majority of the members are men. In the United States the great majority of the teachers are women. This sex difference, incidentally, is not found to so great a degree in European schools. We have very few men teachers in the lower grades. The proportion of men increases in the higher grades and there is a fair number of men in the secondary schools, but, even there, men are still distinctly in the minority. Only in the colleges and professional schools do we find a majority of men.

There is considerable variation in different states and cities in the proportion of women teachers who are married, but for the United States as a whole only about one out of five women teachers is married. In Europe again we find a larger proportion of teachers who are married women. In France, for example, it has been generally assumed that a woman who entered teaching would marry a male teacher and would continue teaching. She would be given

leave of absence whenever required for the birth and early care of children; but she would continue in teaching as a life career.

Men who enter the other professions usually feel that they are undertaking a life career. Both men and women who enter teaching are more likely to consider it a temporary vocation. Women are especially likely to teach for a few years and then quit teaching to marry or to follow some other occupation.

The withdrawal of women from teaching when they marry may be due to choice, but it is enforced by school regulations in many communities. According to Motz,¹⁷ in 1928, which was a period of economic prosperity, 32.6 per cent of the women teachers were married; but in 1938, which was a period of economic depression, only 19.7 per cent were married. At that time many men were unemployed and there was a strong prejudice against permitting married women to work. In 1931, a study made in Ohio showed that 73 per cent of the cities and exempted villages were not employing married women as teachers, with the greatest opposition being found in the smaller cities.

In some other cases superintendents of schools have welcomed married women to their teaching staffs, and some superintendents have said frankly that they could not get enough qualified teachers if they did not employ married women. After World War II, the shortage of teachers was so great that in many communities the restrictions against married women were removed, and even then it was often not possible to obtain an adequate number of qualified teachers.

On the average, teachers in elementary schools teach for the shortest period of time while high school teachers remain in the profession longer. Rural school teachers teach for shorter periods than urban teachers. In the one-room rural schools it is not unusual for one-third of the teachers to be new to their positions each year.

Length of service is positively correlated with the salary scale of the school system. When salaries are very low, as they usually are in rural schools, the length of service is correspondingly short.

The general statistical picture we get of the teaching profession is not encouraging. The typical teacher in the United States is an

unmarried woman who began to teach with the idea that it was a temporary vocation, but who may have continued in the profession for various reasons. Relatively few teachers in the public schools have prepared themselves to enter teaching as a lifetime profession. It seems safe to say that this condition must be changed before we can have the most effective school system. We need a corps of capable, trained and experienced teachers who are teachers by preference and who expect to remain in teaching as a life career. Part of the problem of this chapter will be an examination of the causes of the present situation with suggestions for some remedial measures.

Good and Bad Teachers.—Many studies have been made of teachers and of the qualities that make for successful teaching. These may for convenience be classified into four groups: (1) surveys of the opinions of students, (2) surveys of the opinions of supervisors, (3) experimental studies of the relationship between characteristics of teachers and measured changes in pupils, and (4) the opinions of experts. We shall now consider some of the results obtained by these different approaches.

Hart¹¹ sent questionnaires to 10,000 high school seniors and asked them to describe the teacher they liked best, called "Teacher A," the teacher they liked least, called "Teacher Z," and, in case some teacher other than Teacher A was considered to be the most efficient teacher they had had, they were asked to describe this teacher, called "Teacher H."

Hart selected at random 3,725 of these replies for tabulation. Of these, about 80 per cent said that the best-liked teacher was also the best teacher. About 0.5 per cent said that Teacher Z was the most effective teacher, and about 20 per cent named some teacher other than Teacher A as the most efficient. Table 9 gives the characteristics most often mentioned for these three teachers.

Condensing this table, we find that the best-liked teacher is friendly, fair, and good-natured; she is reasonable in her requirements; she arouses the interest of the students; she is clear and effective in her presentation; and she has control over the class. She gets results.

TABLE 9. A COMPARISON OF "TEACHERS A, Z, AND H." (ADAPTED FROM HART, 11, PP. 131, 250-251, 278-279)*

<i>Rank</i>	<i>Reasons for Liking "Teacher A" Best</i>	<i>Frequency of Mention</i>
1.	Is helpful, explains lessons clearly, uses examples..	1950
2.	Cheerful, happy, has sense of humor	1429
3.	Human, friendly, companionable, "one of us".....	1024
4.	Interested in and understands pupils	937
5.	Makes work interesting, creates desire to work....	805
6.	Strict, controls class, commands respect.....	753
7.	Impartial, shows no favoritism, has no "pets".....	695
8.	Not cross, crabby, grouching, nagging or sarcastic.	613
9.	"We learned the subject"	528
10.	A pleasing personality	504
11.	Patient, kindly, sympathetic	485
12.	Fair in marking and grading, gives fair tests.....	475

<i>Rank</i>	<i>Reasons for Liking "Teacher Z" Least</i>	<i>Frequency of Mention</i>
1.	Too cross, never smiles, nagging, loses temper....	1708
2.	Not helpful, does not explain lessons, work not planned	
3.	Partial, has "pets," and "picks on certain pupils"...	1025
4.	Superior, aloof, haughty, overbearing, does not know you out of class	859
5.	Mean, unreasonable, intolerant, ill mannered, too strict	775
6.	Unfair in marking and grading, unfair tests.....	652
7.	Inconsiderate of pupils' feelings, bawls out pupils in class	614
8.	Not interested in pupils, does not understand them.	551
9.	Unreasonable assignments and home work.....	442
10.	Too loose in discipline, no control of class.....	350
11.	Does not stick to subject, brings in too many irrelevant personal matters, talks too much.....	313
12.	"We did not learn what we were supposed to".....	301
		275

TABLE 9—Continued

Rank	"Teacher H" Differed from "Teacher A" as Follows:	Frequency of Mention
1.	More exacting standards, stricter marking, "we learned more"	267
2.	Better at explaining lessons, work is better planned	155
3.	Knows the subject better, can "put it over" better.	95
4.	Stricter, more rigid discipline.....	85
5.	Makes the work more interesting	46
6.	Is less friendly	39
7.	More serious, more businesslike, keeps closer to subject	38
8.	Less understanding of pupils, less interested in pupils	13
9.	More sarcastic	12
10.	Less attractive	10
11.	More cross and crabby	10
12.	More aloof	6

* From *Teachers and Teaching*, by F. W. Hart. Copyright, 1934; courtesy of the Macmillan Co., New York.

"Teacher H" gets excellent results but is not so well liked by the students. The chief reasons for this lack of popularity seem to be that she lacks a pleasing personality and is more likely to be eccentric; she is stricter, requires more work, and is too busy to have much to do with students outside of class; in addition she is likely to be teaching a more difficult and less interesting subject. In this respect she is the victim of the psychological projections of the students: they blame the teacher for the difficulty of the subject and their own lack of capacity.

"Teacher Z" is essentially a person with a very disagreeable personality who lacks good manners and reasonable consideration for the feelings of others and who does not succeed in getting results. As a disciplinarian, she is likely to be either much too severe or else so lax that she has little control over a class.

For the most part there is nothing very surprising about these findings. Teachers are people, and in large measure we like the same

qualities in teachers that we like in people in general. We like people who are friendly, good-natured, and show evidence of a sense of humor. We also like people who are efficient in their jobs, whether the job be that of plumber, baker, physician, clerk, or teacher. To be a good teacher one must be able to explain things clearly. One must be patient with those who require more than the average amount of explaining. One must present the work in such a manner as to arouse student interest. Efficiency also requires control over the class, reasonably strict but not severe discipline. It may surprise some to learn that students actually prefer the teacher who is not lax in discipline; but children as well as adults like to achieve good results, and even children realize that some consistent effort is necessary for real accomplishment. Hence the teacher who is too easy not only fails to accomplish much but also fails to earn the respect of the pupils. On the other hand, the teacher who is too strict and who requires too much work, and whose marking standards are either too erratic or too much influenced by favoritism, or is too severe, is rightly disliked.

Three out of four teachers in the schools were considered to be more like Teacher A than like Teacher Z, but the remaining one out of four was thought to be more like Teacher Z.

This last point has very serious implications for education. We have found that attitudes are developed largely by indirect suggestion. We tend to imitate the attitudes of people we like and to reject the attitudes of people we dislike. This means that disliked teachers tend to have negativistic effects on pupils. Whatever the teacher favors, the pupils will tend to oppose.

Unpopular teachers also kill the interest of pupils in subjects. Students who take popular courses taught by unpopular teachers are less likely to continue these subjects later. The subject acquires some of the disfavor that was originally based on the unpopular teacher. This is partly due to teacher personality, but is also due in part to poor teaching. Pupils are less likely to continue subjects that have been so poorly taught that they have not been mastered.

No reliable data seem to be available that would show the relative numbers of members of the various trades and professions who

attain a given degree of personal unpopularity, but it appears probable that, if such figures were available, teachers would make a poor showing in that respect. A minister with a savage disposition and an unruly temper would soon find himself preaching to empty pews; physicians and lawyers of that type would drive the customers to other more agreeable practitioners; but compulsory attendance laws, and tenure laws as well as tradition, tend to enable unpopular teachers to continue for year after year to make new crops of enemies.

Another study of student opinion at the high school level by Sister Elvira⁸ may be summarized briefly as follows: Students prefer the teacher who makes a course interesting, who knows the subject, is logical, permits discussions and questions, gives reasonable assignments, is understanding, does not embarrass students, and has a sense of humor.

The opinions of 125 student teachers on the most desirable personality traits of teachers have been reported by Robbins.¹⁰ These were tabulated separately for girls and boys. The twelve most important characteristics were ranked by the girls as follows:

1. Makes the course interesting.
2. Knows the subject-matter of the course.
3. Shows a great deal of enthusiasm.
4. Has the material well organized.
5. Encourages student participation.
6. Uses many practical illustrations.
7. Has a real sense of humor.
8. Has a friendly personality.
9. Shows interest in the students.
10. Has a pleasant voice.
11. Is neat in dress.
12. Has a poised and business-like attitude.

The rankings by the boys were about the same except that student participation was ranked third and sense of humor ranked twelfth.

A comparison of sophomores and juniors showed that the sophomores were somewhat more interested in personality traits

while the juniors were relatively more interested in teaching efficiency.

Two studies that are closely related to the foregoing study were made by Lamson¹⁵ and by Haggard.¹⁰ Lamson asked a group of seniors in the New Jersey State Teachers College at Jersey City to select from a list of eight teacher traits the six they considered most important and to arrange these in rank order. This same list was later used by Haggard on a group of freshmen in the Western Washington College of Education. If these lists are combined by the process of counting a first rank as 6 points, a second rank as 5 points, a third rank as 4 points, and so on, the ranks of the eight characteristics for the two groups of students are as follows:

1. Knowledge of subject matter.
2. Teaching skill.
3. Personality to put the course across.
4. Fairness.
5. Ability to get along with students.
6. Sincerity and honesty.
7. Sense of humor.
8. Appearance.

The students in these last three studies are all, it should be noted, professional students of education, and, to that extent they may not be representative of college students in general. But, in any case, they have placed primary emphasis on the characteristics necessary to get results. They are less concerned about the teacher's voice and appearance.

On the whole, it seems probable that friendly personality traits are considered by students to be relatively most important at the lowest grade levels, but that in graduate schools technical knowledge and teaching efficiency are considered most important.

Perhaps one of the best methods of determining the characteristics that supervisors consider to be important in teachers has been used by Simon.²⁴ This was based on an analysis of the reasons given for dismissing almost 2,000 teachers in smaller schools. The two

most important reasons were unsatisfactory personality traits and inability to maintain satisfactory discipline. The former category will, of course, cover a great variety of personality and character deficiencies; but in most cases it means that the teacher has displeased too many pupils, parents, fellow teachers, and supervisors to continue to hold her position. As long as the teacher maintains reasonable discipline and does not make too many important enemies she may be permitted to teach indefinitely even though her teaching is not efficient.

As a further indication of the importance of personality traits in determining the ratings that teachers receive from supervisors, we may cite a study made by Dodge.⁵ A personality inventory was filled out by 301 teachers and these teachers were divided on the basis of ratings by supervisors into two groups: the more successful and the less successful. It was then found that the more successful teachers were more at ease socially, assumed responsibility more readily, had fewer fears and worries, were more sensitive to social opinion, and were slower in making decisions. In other words, the teachers who were rated better were better in social and emotional adjustment.

In this connection it is important to recall that ratings of personality traits have quite generally been found to have low validities and reliabilities. Different raters who interview the same subjects or who read the same letters of recommendation have been found to disagree greatly in the ranks assigned to particular individuals. This occurs because personality ratings are often influenced greatly by minor and irrelevant characteristics such as long or short fingernails, red hair, protruding teeth, a square jaw or a receding chin, given names, and so on ad infinitum. A characteristic that affects one rater favorably may have no effect on a second rater but may displease a third rater.

A further reason for differences in the ratings of personality traits may be found in the fact that different people may give quite different interpretations to the same facial expression of emotion. It has been the writer's experience that when a group of college psychology students attempts to name the emotions shown in a

group of posed photographs, only about one-third of the names assigned to the pictures agree closely with the labels assigned by a group of judges; about one-third of the names assigned are similar; and the remaining third are quite different. On this basis, therefore, two raters are likely to interpret the same facial expression as a manifestation of quite different personality traits.

Because of these difficulties, it is perhaps to be expected that the ratings given to teachers by supervisors will not have much relation to actual differences in teaching efficiency; and this conclusion has on the whole been supported by experimental studies.

On theoretical grounds the proper method of determining the differences between successful and unsuccessful teachers is to measure the actual changes produced in pupils and then to correlate these changes with measurements of the teachers themselves. If pupil gains are correlated with teacher intelligence, or with teacher sociability, or with teacher dominance, or with teacher liberalism, it should theoretically be possible to show this by giving appropriate tests. If, however, there is no correlation between pupil gains and teacher intelligence or teacher sociability, then it would seem that we must look elsewhere for an explanation of the differences in the success of different teachers.

In actual practice, however, it is far from easy to solve this problem by experiment. We shall need first of all to decide just what changes in pupils are desired; and, it so happens, the leaders in education have not been able to agree on the answer to this question. As a result we cannot be sure as to what changes we should attempt to measure, or as to the relative weights to be assigned to such changes as may be measured.

In the next place, we have not yet developed adequate measuring scales for some of the changes in attitudes and personality traits that are thought to be important possible results of school training. When, therefore, we attempt to develop certain social attitudes in a course of social science, we are not able to determine with any great assurance just what changes have taken place as a result of instruction.

We are able to measure with considerable accuracy increases in knowledge and increases in the ability to understand and to apply principles within limited areas, and we can measure rather accurately certain other skills, but there are certain intangible results of education that are, at best, very difficult to appraise. Consequently, while experimentation and measurement may be regarded as the ideal method of solving this problem, we are not yet ready to arrive at a complete solution in that way. With this reservation in mind, we may now turn to some experimental studies of the relationship between measured changes in pupils and the characteristics of teachers.

Bollinger² gave a series of tests to 18 teachers and 405 pupils in three small Wisconsin high schools and failed to find any statistically significant pupil gains on tests of social adjustment and attitudes that could be correlated with the characteristics of the teachers. He did find, however, that 95 per cent of the students thought the teachers' character and personality to be important. They considered fairness to students, knowledge of subject matter, and high ideals the most important teacher characteristics. About one-third of these students indicated a desire to talk over problems with teachers, but only about 10 per cent had actually done so. This at least suggests that better student-teacher rapport might have helped to solve some student personality problems.

In another study, Brookover³ attempted to appraise the relation of certain social factors to the efficiency of teachers. For this purpose 66 Indiana male high school teachers of United States history at the junior level were selected. These teachers were rated for teaching efficiency by pupils, by supervisors, and by school trustees; and pupil gains in history were determined by objective tests. It was found that pupil gains in information increased with the age of the teacher to 38 years and then decreased; but both the pupils and the trustees rated the older teachers as more effective. Subjective ratings of teacher efficiency by pupils, superintendents, and trustees were correlated, but the employer ratings were not correlated with pupil gains. Pupil ratings of teachers showed low but inconsistent agreement with actual gain scores. The teachers who had closer

personal relations with students were found to teach slightly less history, but such teachers tended to be rated higher by pupils, supervisors, and trustees. It is, of course, quite possible that these teachers did have more influence on the attitudes and personalities of the students, even though the students gained slightly less knowledge of history.

In a group of related studies by Rostker,²¹ Rolfe,²⁰ and LaDuke,¹⁴ it was found that correlations between pupil gains and different measurements of teachers were generally low; but by combining the scores for batteries of tests, ranging from 4 to 14 in number, multiple correlations between teacher characteristics and pupil gains could be obtained that ranged from .65 to .84.

A comparison of these studies further shows that the same teacher characteristic may vary in importance in different teaching situations. Teacher intelligence, for example, showed a statistically insignificant correlation of $-.10$ with pupil gains in rural schools, whereas in the teaching of seventh and eighth grade social science in larger schools the intelligence of the teacher seemed to be an important factor. This is perhaps what might have been anticipated: pupils in small rural schools are thrown very largely on their own resources; but, in any case, it would seem to suggest that it will be necessary to determine different weights for the desirable characteristics of teachers in different situations. It seems reasonable to assume, for example, that intelligence is relatively more important in college teachers than in grade teachers, and that social attitudes are relatively more important in teachers of literature and social science than in teachers of mathematics and physical sciences.

In a study of successful teachers, average teachers, and failing teachers at the time of their graduation from college, Shannon²² also found correlations between different measurements of teachers and measurements of pupil gains to be generally low. However, two of his findings deserve mention. The more successful teachers participated to a greater extent in extracurricular activities. This is true, perhaps, because participation in such activities ordinarily indicates better health and better social adjustment. A more surprising finding was that the failing women teachers had higher

average intelligence than either the average or the successful women teachers. This is probably not a typical result, but it is of interest in that it agrees with a common view that teaching success is conditioned more by personality factors than by intelligence. Also, the most intelligent beginning teachers may well find it more difficult to adjust their teaching to the needs of pupils of low levels of intelligence.

In this connection it is perhaps worth noting that the average intelligence of the students in colleges for teachers is somewhat below that of students in four-year colleges. Welborn²⁵ tabulated the results reported for the American Council on Education Psychological Examination for the years 1935-1944 and found that the mean score for students in teachers' colleges was 113.56 as compared with a mean score of 125.39 for students in four-year colleges. The average raw score of the education students is about 10 per cent lower than that of the other students, but since these tests do not have true zeroes and since the actual test zeroes are well above a true zero of intelligence, the true percentage difference between the two groups of students must be considerably less than 10 per cent. Even so, these figures show that our teaching staff is not as intelligent as it might be.

Hellfritzsche¹² made a factor analysis of the qualities of teachers related to success and concluded that the most important qualities could be analyzed into four uncorrelated variables:

1. General mental ability and knowledge.
2. A supervisory rating factor.
3. Personal emotional adjustment.
4. A eulogizing attitude toward the teaching profession.

The second factor, a supervisory rating factor, is of somewhat uncertain significance, but it would probably relate especially to personality qualities related to good discipline and to creating a good impression on other people, including pupils, supervisors, and the general public. Factors one and three hardly require comment, but factor four would seem to be especially important in that the

teacher who thinks well of the teaching profession is much more likely to give her best efforts to teaching than is the teacher who neither likes nor respects her position.

Expert opinions as to the qualifications of teachers are too numerous to review adequately; for that reason we shall confine our attention to two. Corey⁴ has outlined the most important teacher characteristics as follows:

1. Ability to learn about children.
2. Ability to describe desired outcomes of teaching.
3. Ability to appraise the results of learning.
4. Ability to stimulate the curiosity of pupils.
5. Ability to provide a variety of learning experiences.
6. Ability to use his own knowledge for transfer and applications.

This list may not cover all of the important characteristics of teachers, but it does cover some of the more important ones. Evans and Wrenn⁷ have considered the troublesome problem of introversion and extroversion and conclude that the best combination for teachers is thinking introversion and social extroversion; that is, the teacher should be a student and a thinker, but she should also be well adjusted socially and should enjoy and feel at ease in her social contacts.

The general conclusion to which these studies would seem to point is that teaching is a very complex process and that the requirements for successful teaching vary greatly under different conditions. Consequently the teacher who fails in one situation might well be a success in a different position. There are, of course, certain minimum requirements in the way of intelligence, character, personality and health, but even these will vary a great deal in relation to different teaching assignments.

DIFFICULTIES OF THE TEACHING PROFESSION

When an automobile is not operating properly, we normally try to locate the difficulty and correct it. This is the simple and common-

sense procedure. On a similar common-sense basis it would seem that if we are not entirely satisfied with our teachers and their performance we should locate the difficulties and attempt to correct them. To do this properly we need to follow the approach of clinical psychology and consider all phases of the teacher's life and work because we know that performance is influenced by economic, social, medical and other factors as well as those that are commonly considered under the heading of "psychological."

Personnel departments in large corporations have learned that it pays to have complete free medical service for the families of workers because illness in the family may interfere seriously with the efficiency of the father. The financial worries resulting from hospital bills and the large fees often charged for surgical operations may easily impair a worker's health and morale. Similarly, some corporations offer virtually free legal services for their workers with the aim of helping them to solve problems that might otherwise interfere with their efficiency. These and other measures are not taken for humanitarian reasons but simply because they are thought to be necessary for the efficiency of the corporation itself. Experience has shown that any kind of difficulty may interfere seriously with the efficiency of workers. This applies to teachers as well as to factory workmen. With that in mind we shall consider some of the major causes of dissatisfaction, low morale, and inefficiency in the teaching profession.

There is considerable correlation between teachers' salaries and school efficiency. The highest salaries tend to be found in the most efficient systems. The lowest salaries are found in the poorest rural schools. This means that, in general, the teachers who receive the lowest salaries have the least training and experience and are least likely to remain in teaching as a profession. Hence they have the least professional interest.

During World War II the wages of factory workers increased greatly and further increases followed shortly after the war. This was associated with great increases in the prices of goods and services and with corresponding increases in taxes; but teachers did not receive corresponding increases in pay. As a result, the economic

position of teachers has become worse than before. This has been summarized by a committee of The American Council on Education¹ (p. 10) as follows:

During the war, of course, teachers' salaries rose. By 1945 the average annual figure had reached \$1786. But where did this increase of 24 per cent in four years leave the teachers? It left them, because of higher prices, with less purchasing power than they had had at the start. It left them far behind full-time employees in private industry, whose average annual earnings had climbed 56 per cent in three years, to put industrial workers, even by 1943, \$427 a year ahead of the teachers. It left the teachers, in 1945, receiving on the average less than the salary a bright sixteen-year-old boy, not yet through high school, could earn as a filing clerk in a government office.

Shuttleworth²³ compared the shift in relative incomes of teachers and of wage workers in manufacturing, transportation, and mining between 1932 and 1945, after making corrections for unemployment and income taxes and stating the results in terms of the purchasing power of 1935-1939 dollars. On this basis, in 1932, the average income of wage workers was \$736 and that of teachers was \$1406; but in 1945 the corresponding figures were \$1689 and \$1292. While wage workers were gaining more than 100 per cent in wages, teachers were actually losing, and in 1945 were receiving less than the wage workers. Small wonder then that, while the enrollments in colleges increased greatly after World War II, the enrollment in many colleges for teachers actually decreased!

This condition has tended to prevent teachers who had entered military service or factory work during the war from returning to teaching and it was also largely responsible for the reduction in the enrollments of colleges of education. At the present time the low salary schedule of teachers is the most serious obstacle in the way of developing a corps of high grade teachers.

The average young woman wishes to marry and raise a family and, for the population as a whole, the great majority of women do marry. In this country, however, there is a distinct prejudice against the employment of married teachers, and, in many states and cities, there are also legal restrictions on the marriage of women

teachers. As a result the majority of our women teachers are single.

This situation affects the teaching group unfavorably in three different ways. In the first place, it tends to discourage women from entering the teaching profession if they know that they wish to marry and raise a family. In the second place, it seems probable that, on the average, the single women with the more attractive personalities will be the ones who marry and leave the profession so that those who remain will be personally less attractive. In the third place, the majority of those who fail to marry will experience a feeling of frustration that will tend to make their personalities and general behavior even less attractive. This will largely account for many of the teachers who are disliked by the pupils.

The nervous strain involved in teaching is greater than that involved in most professions, and when the time required for the preparation of assignments and the reading of papers is added to the scheduled teaching hours it appears that in many cases teachers must work for excessively long hours in order to do their work. As a result many teachers suffer from overwork. This tends to make them cross, irritable, nervous, and unreasonable; and, as several studies have shown, too many teachers are either definitely psychopathic or show psychopathic tendencies.^{13,16} The children suffer, and the teachers are blamed for failure to carry cheerfully and efficiently their unreasonable load of work.

There are great individual differences in capacity for doing prolonged mental work, but our public school schedules fail almost entirely to take this factor into account.

One factor that is frequently responsible for teacher fatigue is large classes. Most teachers are familiar with the fact that large classes are more fatiguing than small ones. Discipline is harder to maintain in the large class, the teacher must speak with more force, there are more individual problems to be dealt with, and, of course, if there are papers and reports, such work increases directly in proportion to the size of the class.

Another factor that increases the difficulties of the teacher is lack of equipment. The less equipment there is, the more the teacher

must talk or the more time the teacher must spend in devising, making, and otherwise obtaining equipment. However, when materials and supplies and apparatus are available, the teacher can show rather than describe, and can throw onto the shoulders of the students more of the responsibility for learning. Frequently a moving picture will teach more in less time and with less effort than can be accomplished in any other way. Laboratory work, likewise, which, of course, requires materials and equipment, will, at times, enable pupils to learn things more readily, more thoroughly, and with more interest than when other methods are used.

A difficulty of a very different type is found in the fads and fashions that sweep periodically over the educational world. Various writers and speakers have commented on the fact that education is not yet an established science and that, as a result, educational theory and practice are subject to many relatively short-lived fads. This has been especially true of some phases of Progressive education and of the use of tests of intelligence and of achievement. To many educators, Progressive education became a religious cult: if one dared to question the universal validity of its assumptions, he was promptly branded as a mossback or worse. A similar situation existed in the early days of the objective testing movement. Essay examinations became suddenly taboo to the faithful, who might, however, base a large part of a semester grade on a short true-false test. In the same way, early intelligence tests were held by many to be nearly perfect measures of native intelligence, and the IQ, when determined by competent examiners, was thought to be almost constant.

In these and other cases, careful scientific work and experience have, in time, indicated more moderate and tenable views. The ordinary teacher, however, concerned primarily with the urgent problems of the classroom, is buffeted back and forth by these changing educational winds. Engineers, in contrast, are less disturbed by passing fads and propaganda and are enabled to feel a greater degree of security and confidence in the correctness of their procedures.

On the other hand, since teaching is not based adequately on established scientific principles, there is obviously more room for improvement, and improvements do occur with the passage of time.

This makes it necessary for a teacher to be progressive and to change her ideas and procedures as newer and better methods are developed.

This need for change comes into conflict with a considerable amount of inertia in the teaching profession. Teachers, like other workers, tend to become creatures of habit and to become set in their established ways of doing things. Under certain conditions they are protected from competition and are free to continue practices that would be less likely to survive in a really competitive situation. When, for example, sophomore English is required of all students in a college, and when only one teacher teaches sophomore English, the sophomore must perforce take the course as given by that instructor even though the course has not been significantly changed since the sophomore's father took the course a quarter of a century before.

Habit and tradition become characteristic of institutions and of school systems as well as of individuals. College entrance and graduation requirements may remain fixed for many years with the result that they cease to be in harmony with new needs, principles, and practices. There is a strong tendency in most school systems for curricula and methods to follow traditional ideas rather than to be truly progressive. So if a teacher is progressive and is interested in making changes she soon finds that established practices are difficult to modify except within the realm of her own classroom work, and even that may be determined largely by fixed curricular and other requirements.

Here we encounter another difficulty that is commonly faced by teachers. The government of many school systems is autocratic, and the teachers may have little or no voice in determining either the content of the curriculum or the methods of teaching. The teacher is expected to put into execution plans that have been made by higher school officials or perhaps by legislative bodies. In such cases if the teacher has ideas of her own she has little chance of giving them a fair trial. As a result, under these conditions the teacher who gets along best is the one who accepts uncritically any and all directions given her. This encourages the development of

a teaching staff without too much intelligence, enterprise, or interest in the educational results of their efforts.

This condition is made worse when, as frequently happens, the superintendents and higher school officials are selected more for political ability than for educational training and insight. In such cases autocratic control quite naturally tends to drive the best teachers to look for better positions as teachers or to leave the teaching profession entirely.

By profession and training the teacher tends to be a perfectionist. She is expected to be always right. If pupils find that she has made errors, they are likely to make much of the fact. Consequently, the teacher must at least try to be perfect. Furthermore, in spite of the efforts to introduce democracy into the schools, the teacher is the supreme ruler of her little circle. She is usually older, wiser, and stronger than her charges. She does not compete with those of her own level of ability. This suggests the familiar dictum of Lord Acton that all power tends to corrupt and that absolute power corrupts absolutely. Not infrequently we find teachers who show the effects of this kind of corruption. At the same time there is a real need that teachers be reasonable, humane and tolerant, and that they have a sense of humor. Some of the teachers who fail do so because they deviate too far in the direction of the perfectionist and the autocrat who can do no wrong.

The teacher's position causes her to be the logical victim of the Freudian mechanism known as projection. The psychoanalysts have stressed the point that we do not like to accept responsibility for errors and shortcomings, and that this is especially true of those who have not arrived at emotional maturity. Pupils, instead of admitting that they are at fault, that they are perhaps less than geniuses of the first rank in ability, and that they do not work as much as they might, may prefer to salve their egos by holding the teacher responsible for all of their shortcomings. They are likely to claim that they are not very good in arithmetic because their teacher is such a poor arithmetic teacher. This situation is perhaps inevitable to a large degree, but it should help somewhat if the teacher understands the mechanism.

The social position of the teacher is also difficult. The young woman teacher must be careful about having too many or perhaps any dates. She may find strong community objections against such activities as smoking, dancing, and playing cards. In some places she might perhaps be known to indulge in such activities and still keep her position, but in other locations such information would cause her to be dismissed or at least not to be re-employed. She is expected to conform to all of the taboos of all the people in her community. If she does not do this, she will be criticized; if she does, she will be shunned.

Teachers in rural communities are frequently so isolated that little social life is possible and this is one of the reasons why the average rural teacher does not remain long in the same position.

The social difficulties of the teacher relate also to the problem of relaxation. Teachers need diversions and relaxation perhaps more than most other workers need them, but because of the taboos surrounding teachers they find their opportunities for diversion and relaxation to be more limited than those of the average person.

A final difficulty to be mentioned here is that of tenure and promotion. Many thousands of teachers have been dismissed arbitrarily and without any legitimate cause. The superintendent or some board member may have developed a dislike for them on purely personal and petty grounds, and this may cause dismissal. This has been such a common occurrence in the past that tenure laws have been passed in many states. These usually make it impossible to discharge teachers, once they are placed on tenure, unless they are guilty of some grave breach of personal or professional ethics or unless they otherwise have become quite impossible.

Absence of tenure makes a teacher insecure and unable for that reason to do her best work and tends to discourage young men and women from entering teaching as a profession. However, once the teacher has attained tenure it is possible to relapse to a third-rate level of teaching and to continue in a position. Most teachers on tenure will continue to try to teach effectively, but it is inevitable that some teachers will make the most of their pro-

protected status. This raises the question as to how we may best protect both the interests of the teachers and those of the children.

The ideal basis for promotion would be efficiency, but there are so many factors involved in determining a teacher's total efficiency and so many of these factors are unmeasurable intangibles that no really accurate evaluation of the worth of a teacher is at present possible. As a result a teacher tends to be promoted on the basis of years of service, or on the basis of an accumulation of academic credits in education and related subjects, or perhaps on the basis of ability to get offers from other school systems at a salary higher than that currently held. Supply and demand are also factors in determining tenure and promotion, and when there is a shortage of teachers, school systems are forced to offer greater inducements to the teaching staff.

APPLICATIONS

The reader may feel that the difficulties of the teaching profession have been needlessly exaggerated. They are, however, real difficulties and very serious difficulties and it would seem that the best way of correcting them is to begin with a candid enumeration and analysis of the present situation. That is the reason we have listed them here.

Below are enumerated some of the steps that seem necessary in order to correct or at least lessen the existing difficulties of the teaching profession.

1. *Raise salaries.* Teachers' salaries are so out of line with those of the rest of the population that an increase of at least 50 per cent will be necessary to enable teaching to compete with other professions that require similar intelligence and training. Even then the pay of teachers would be below that of railroad conductors and engineers, plumbers, welders and others who require neither the intelligence nor the training of the teacher and whose work does not begin to have the social importance of teaching. How to obtain this raise is another problem. The railroad unions and various other unions have reached their present wage scales by using their union organizations to force successive large increases in pay.

Some believe that it will be necessary for teachers to organize unions and to use similar tactics to obtain pay increases, while others urge that such methods are incompatible with the social and ethical status of the teaching profession.

The problem is likely to prove more difficult because teachers' salaries must be paid from taxes, and after the staggering taxes resulting from World War II, the taxpayers are likely to be very reluctant to vote the further tax increases necessary to give adequate pay increases to teachers. In this case, the taxpayers' children will be the chief sufferers.

In the long run, equitable salaries for teachers will require that salaries be tied to the cost of living, so that when other workers obtain wage increases, with resultant increases in the cost of living, there will be automatic and immediate compensatory increases for the teachers.

2. *Encourage the marriage of teachers.* In our schools we have often tended to insist on celibacy for women teachers. This involves an important psychological contradiction. To be a good teacher a woman should love children, and if she does love children she will normally desire to have children of her own. If she fails in this she may be expected to feel a considerable degree of frustration. Yet the policy of many of our school systems is to dismiss women teachers who marry and to refuse to employ married teachers. If we are to have a satisfactory teaching staff, it will be necessary to remove these restrictions and actively to encourage the development of a staff consisting largely of married teachers. We could very well follow the French practice of permitting young married teachers to teach and expect to give them leaves of absence when necessary.

If a full teaching load is considered too much for a young married teacher, who also has the responsibilities of a family, it would not be especially difficult to work out a schedule in which such women would teach for only half time. This would keep them actively engaged in the profession, and, at a later date, they might perhaps return to a full-time position.

During World War II many workers who were regularly employed elsewhere were employed by war plants for a four-hour

shift daily, and in many cases these half-day workers produced more than half as much as was produced by regular workers on a full-day schedule. It is quite possible, therefore, that selected part-time teachers might have a higher average efficiency than is found for the regular teaching staff.

Another possibility is to encourage women to return to teaching when their families have reached the age at which they attend school. This would permit many teachers to return to teaching when they are still young enough to have twenty or thirty years of teaching service ahead of them. In such cases, if teachers had taught before they had married, they might, to some extent, act as substitute teachers during the years when they were not on the regular teaching staff.

Probably a very large part of the prejudice against married women has, at times, stemmed from a shortage of jobs which has been periodically a characteristic of our economic system. The feeling has been that a married woman should not deprive some single woman of an income. The writer's answer to this is that the interests of the children should come first, and he does not believe that we can have a really satisfactory corps of teachers until we have teachers who consider teaching to be a lifetime profession and who teach long enough to acquire the skill and wisdom that rarely come without considerable experience. There is also the more general question: must an intelligent woman who is trained to do an important job give that up when she marries, and retire for life to the chores of housekeeping? Certainly many women will insist on having activities outside of the home, and if the schools drive them away, they will go into business or into something else with more reasonable rules.

A further argument for the employment of married women as teachers may be found in the fact that the salaries of teachers are not likely in the near future to reach levels comparable to those in industry. It may consequently be possible to employ competent married women who will be able and willing to teach for less because they have only partial responsibility for the support of a family.

3. *Employ more teachers.* If teachers are not to be overworked, it will be necessary to reduce the size of classes in many schools and perhaps also in some cases to reduce the number of classes taught by a teacher. This will require the employment of more teachers and it may require the building of additional classrooms. Also, in many cases additional equipment will be necessary both in the interests of efficiency and to save the teacher from excessive work.

4. *Give inservice training to teachers.* If teachers are to achieve the greatest degree of skill, they must continue to improve for a good many years after they begin to teach. This will require constructive supervision and training while teachers are in service. This in turn will require the employment of supervisors who are capable of giving such training. In addition, the recent practice of asking for constructive criticisms from students should be helpful, though we should not make the mistake of assuming that student judgments in this case are infallible.

5. *Make the schools more democratic.* Teachers should have an important part in determining the content of the curriculum and the nature of the methods that are used in teaching. This is a psychological necessity if the teachers are to take an active interest in the improvement of teaching. Also, without going to extremes in the matter, more democracy can often be introduced into the classroom. This will tend to reduce the burdens of the teacher and will be beneficial to students as well.

6. *Promote research on the best methods of selecting and promoting teachers.* Present tenure laws do not guarantee good teaching. Effective teachers must be protected from dismissal on insufficient grounds, but, at the same time, more effective and scientific safeguards must be developed to protect the interests of the pupils. No perfect solution to this problem is possible, but present methods can be greatly improved.

QUESTIONS AND EXERCISES

1. In cities where married women are not employed as teachers, what are the probable effects on the teaching staff?
2. In high schools in which most of the teachers are women, what are the probable effects on the boys in school?

3. As judged by students, what are the characteristics of the best-liked teachers?
4. What are the characteristics of the teachers who are liked least by students?
5. How do the best-liked teachers differ from the most effective teachers?
6. How do students at higher and lower grade levels differ in the characteristics that they consider most important in teachers?
7. How do you account for the finding that the average intelligence of students in colleges of education is lower than that of students in colleges of liberal arts?
8. What has been the general trend in the purchasing power of teachers' salaries since 1930?
9. In what different ways do low salaries affect the teaching profession?
10. What steps might be taken to reduce the nerve strain associated with teaching?
11. What are the more important psychological sources of inertia in the teaching profession?
12. Compare the desirable and the undesirable effects of tenure for teachers.
13. Why is it difficult to base the promotions of teachers simply on teaching efficiency?
14. What are the good and bad features of having teachers rated by students?
15. How do autocratic and democratic methods of school control affect teachers?

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INDEX OF NAMES

Abel, T. M., 245
Ackerson, L., 338
Alexander, T., 124
Allen, C. F., 124
Almack, J. C., 423, 449
Altman, E., 422
Amis, O. C., 302 f., 310
Anderson, J. E., 39, 58
Angell, G. W., 371
Archer, R. L., 4 f., 21
Armstrong, L. E., 158
Asch, S. E., 310
Ayres, L. P., 26

Bacon, F., 239
Baggaley, A. R., 336
Baisden, L. B., 80, 97
Baker, H. J., 447
Barlow, J., 396
Barton, G. E., 97
Baruch, D. W., 422
Barzun, J., 5, 21
Bateman, R. M., 310
Baxter, B., 336
Bean, C. H., 494, 507
Beers, C. W., 399
Bell, H. M., 79, 97
Bennett, M. W., 336
Benson, V. E., 43, 58
Betts, E. A., 182
Bigelow, K. W., 534
Bird, C., 396
Bird, D. M., 396
Blair, G. M., 6, 21
Bloom, B. S., 245
Bollinger, R. V., 519, 534
Bossing, N. L., 245
Boynton, P. L., 97
Bradway, K. P., 480
Brain, W. R., 284
Breed, F. S., 507
Brickman, W. W., 182

Bristow, W. H., 97
Broadley, M. E., 473, 481
Bronner, A. F., 448, 508
Brockover, W. B., 519, 534
Brown, F. J., 299, 301, 310
Brownell, W. A., 8 f., 21, 217
Brueckner, L. J., 97
Bryant, I. P., 182
Bullen, A. K., 284
Burkart, K. H., 170, 175, 182
Burkhard, W. J., 80, 97
Burnham, P. S., 337
Burnham, W. H., 399, 407 ff., 422
Burri, C., 182
Buswell, G. T., 133, 158
Buxton, C., 284

Callewaert, H., 284
Campbell, N. M., 503 f., 507
Cantril, H., 311
Carr, H. A., 18, 21
Carroll, J. B., 337
Carter, H. D., 337
Cason, E. B., 174, 182
Cattell, P., 447
Cavanaugh, J. O., 124
Charters, W. W., 7, 21, 124
Clark, M. K., 38, 58
Cohler, M. J., 447
Cole, L., 396
Cole, P. O., 54, 58
Combs, A. W., 59, 218, 303, 311, 415, 423, 505, 508
Conklin, A. M., 447
Conrad, H. S., 58, 245
Conroy, P. R., 507
Cook, T. W., 217
Corey, S. M., 522, 534
Cornell, E. L., 27, 58
Cory, F. B. B., 124
Cotton, H. A., 402

- Counselbaum, S. L., 124
 Counts, G. S., 489 f., 507
 Courtis, S. A., 83, 84, 97
 Cowley, W. H., 507
 Cox, P. W. L., 481
 Craig, H., 29
 Crawford, A. B., 337
 Crews, A., 396
 Crider, B., 284
 Crook, M. N., 447
 Cross, T. J., 268, 284
 Crow, A., 422
 Crow, L. D., 304, 310, 422
 Cuff, N. B., 4, 21
 Curtis, F. D., 371
 Cutts, N. E., 422, 508
- Dale, E., 158**
 Davidson, W. M., 337
 Davies, D. R., 284
 Davis, R. A., 6, 21, 158, 217, 246
 Dearborn, W. F., 455, 481
 Dewey, J., 97, 158, 487
 DiMichael, S., 396
 Dodge, A. F., 517, 534
 Doll, E. A., 448
 Doll, R. C., 158
 Doob, L. W., 310
 Douglass, H. R., 158, 217
 Duff, J. C., 481
 Dunlap, J. W., 371
 Dunlap, K., 208, 279, 284 f.
 Dupee, C. W., 217
 Durant, W., 508
- Echols, M. N., 422**
 Edwards, N., 27, 58
 Eells, W. C., 124, 245
 Ehrlich, G., 284
 Elicker, P. E., 61, 97, 124
 Ellis, A., 182, 337
 Ellis, R. S., 58, 226, 227, 337, 371
 Elvira, M., 515, 534
 Emme, E. E., 5, 21
 Engle, E., 310
 Engle, T. L., 310
 Englehart, M. D., 371
- Erickson, C. E., 467 f., 481
 Espenschade, A., 284
 Estes, W. K., 508
 Evans, C., 522, 534
- Fairbank, R. E., 481
 Fenton, N., 422, 535
 Ferguson, J. M., 396
 Fichte, J. G., 484
 Findley, W. G., 337
 Fleming, V., 311
 Flesher, W. R., 8, 22
 Forry, K. M., 79, 98
 Foster, E. M., 59
 Foster, R. G., 97
 Fox, C., 245
 Fox, W. H., 337
 Frank, L. K., 403 f., 422
 Frazier, B. W., 535
 Freeman, F. N., 58, 254 f., 285
 Fulton, R. E., 284
- Gage, N. L., 372**
 Garretson, O. K., 481
 Garrett, H. E., 38, 59, 481
 Garrison, K. C., 448
 Gates, A. I., 182, 217
 Geisel, J. B., 422
 Gerberich, J. R., 371
 Giese, W. J., 59
 Gilkey, B. G., 182
 Gilkey, R., 59
 Gillette, M. M., 182
 Gilliland, A. R., 158, 217
 Glaser, E. M., 245
 Goldberg, M. H., 124
 Goodenough, F. L., 59, 337
 Graham, A. W., 124
 Graham, J. L., 310
 Greene, H. A., 371
 Greenleaf, W. J., 481
 Guilford, J. P., 59, 371
- Haas, R. B., 182**
 Haggard, W. W., 516, 535
 Hamilton, D. M., 124
 Hand, H. C., 97, 124

- Harap, H., 97
Harding, L. W., 182
Harrower, M. R., 508
Hart, F. W., 511 f., 535
Hartson, L. D., 481
Harvey, C. C., 124
Hawkes, H. E., 371
Healy, W., 448, 508
Held, O. C., 57, 59
Hellfritsch, A. G., 521, 535
Henderson, M. T., 396
Herbart, J. F., 129 f., 161
Herrick, V. E., 98
Hicks, F. R., 535
Higbie, E. C., 508
Hildreth, G. H., 439, 448
Hill, A. V., 284
Hill, G. E., 158
Hill, L. B., 265, 285
Himmelreich, W. F., 508
Hollingworth, L. S., 440, 448
Holmes, F. B., 302, 310
Hoskins, R. G., 448
Hunnicut, C. W., 396
Hunter, N., 285
Hurlock, E. B., 140 f., 158
Hobson, J. R., 45, 59
Hockett, J. A., 79, 98
Hult, E., 5 f., 22
- Jacobson, E., 100, 124, 404, 423
James, W., 16, 423, 487
Jayne, C. D., 182
Jersild, A. T., 93, 94, 98, 266,
285, 302, 310, 371
Johnson, B. L., 82, 98
Johnson, P. O., 75, 98
Johnson, W., 285
Johnston, E. G., 124
Jones, A. J., 481
Jones, D. M., 158
Jones, N. F., 331
Jones, H. E., 5, 22, 58, 245, 257,
285
Jones, H. M., 124
Jorgensen, A. N., 371
- Jest, A., 73
Judd, C. H., 5, 22, 67, 92, 98
- Kawin, E., 481
Keister, M. E., 423
Kelly, W. A., 6 f., 22
Klapper, P., 508
Kroeber, A. L., 448
Kuder, F., 337
Kumin, E., 41, 60
- La Duke, C. V., 520, 535
Lamson, E. E., 516, 535
Lantz, B., 182
Lashley, K. S., 18, 22
Layton, E. T., 98
Layton, R. B., 337
Lee, D. M., 337
Lefford, A., 246
Leipold, L. E., 396
Lestor, E. J., 423
Levine, J. M., 189 f., 217
Lewin, K., 136, 158, 311
Lewis, W. D., 39, 59, 438, 439,
448
Liebes, G. B., 182
Lindahl, H. M., 484, 508
Lindop, B., 182
Lindquist, E. F., 371
Ling, B. C., 246
Lippitt, R., 311
Little, J. K., 357, 358, 371
Long, L., 246
Lovell, C., 371
Luchins, A. S., 59
Luchins, E. H., 59
Lurie, L. A., 448
- McCandless, R. A., 371
McCloy, C. H., 281, 285
McElwee, E. W., 439, 448
McGeoch, J. A., 217
McNamara, M., 481
Maier, N. R. F., 246
Maller, J. B., 27, 59
Mann, C. R., 371
Marks, A., 126, 128, 159

- Mason, F. V., 416, 423, 535
 Mateer, F., 508
 Means, H. W., 124
 Megroth, E. J., 397
 Mellone, M., 182
 Meltzer, H., 421, 423
 Menninger, W. C., 398, 423
 Merideth, G. H., 423
 Merrill, M. A., 98
 Miles, C. C., 448
 Miller, C. G., 483, 508
 Moffie, D. J., 458 f., 481
 Monroe, W. S., 126, 128, 159
 Moore, R. B., 285
 Moore, W. S., 241, 246
 Morphett, M. V., 71, 98
 Morrison, H. C., 141, 159, 207
 Morsh, J. E., 285
 Moseley, N., 422, 508
 Motz, A. B., 510, 535
 Muntyan, M., 337
 Murphy, G., 11, 189, 217
 Murphy, H. A., 174, 182
 Musselman, J. W., 439, 448

 Nelson, S. F., 285
 Neumeyer, M. H., 448
 Neville, E. M., 440, 448
 Newcomb, T. M., 296, 311
 Newman, E. B., 217
 Northway, M. L., 295, 311

 Oden, M. H., 439 f., 449
 Ojennann, R. H., 371
 Orata, P. T., 217
 Osborn, J. K., 508
 Otto, H. J., 423

 Packer, H. O., 182
 Painter, W. I., 508
 Park, G. E., 182
 Parr, F. W., 182
 Partridge, E. D., 125
 Paulsen, G. B., 261, 285
 Perry, W. M., 423
 Peters, F. B., 372
 Peterson, R. C., 298, 311

 Pflieger, E. F., 83, 84, 98
 Phelps, S. P., 124
 Phillips, A. J., 372
 Piaget, J., 225, 246
 Pillsbury, W. B., 217
 Prescott, D. A., 311, 535
 Pressey, L. C., 241, 246
 Pressey, S. L., 443 f., 448, 481
 Pritchard, R. A., 81, 98
 Pumala, E. E., 125
 Pyle, W. H., 40, 228 f., 246

 Raths, L., 159
 Reed, H. B., 207, 218
 Remmers, H. H., 310, 372
 Rennie, T. A. C., 423
 Renshaw, S., 174, 183
 Rinsland, H. D., 372
 Risen, G., 423
 Robbins, F. G., 515, 535
 Roberts, K. E., 311
 Robinson, F. P., 397
 Rogers, E. G., 159
 Rolfe, J. F., 520, 535
 Rood, E. J., 217
 Ross, C. C., 337, 372
 Rostker, L. E., 520, 535
 Rothney, J. W. M., 455, 481
 Rousseau, J. J., 485
 Rubenstein, L., 311
 Rubinshtein, S. L., 22
 Russell, D. H., 182
 Ryan, W. C., 423
 Ryans, D. G., 159

 Samuels, F., 183
 Sands, L. B., 79, 98, 159
 Sarason, S. B., 449
 Scates, D. E., 337
 Schlesser, G. E., 337
 Sears, P. S., 449
 Seashore, H. G., 285
 Seashore, R. H., 397
 Segel, D., 59
 Shakespeare, J. J., 79, 98
 Shannon, J. R., 535
 Sharp, L. B., 125

- Shartle, C. L., 481
Shay, C. T., 269, 285
Sherif, M., 311
Shuttleworth, F. K., 524, 535
Simon, D. L., 516 f., 535
Simpson, R. G., 159
Sims, V. M., 337, 372
Sleight, N., 53, 59
Smith, E. R., 337
Smith, G. E., 467 f., 481
Smith, H. P., 125
Snyder, W. U., 423
Snygg, D., 59, 218, 303, 311, 415, 423, 505, 508
Sparling, E. J., 465, 481
Spearman, C., 320
Speer, G. S., 470, 481
Spencer, H., 11, 145, 147
Spitzer, H. F., 159, 218, 432 f., 449
Sprow, A. J., 481
Stalnaker, J. M., 372
Starch, D., 29, 372
Starr, G. G., 301 f., 311
Stegeman, W. H., 212, 218
Stewart, D. H., 159
Stone, J. C., 453, 481
Strang, R. M., 35, 59, 125, 481, 502, 508
Street, R. F., 175, 183, 423
Strong, E. K., 337
Sumption, M. R., 449
Super, D. E., 125, 337, 481
Svehla, G., 296, 311
Sylvester, A., 217
Symonds, P. M., 80, 98, 423

Taylor, H. E., 158
Taylor, K. V. F., 482
Terman, L. M., 98, 320, 323 f., 325, 416 f., 423, 438, 439 f., 449
Thompson, C. W., 449
Thompson, J., 246
Thorndike, E. L., 5, 9, 17, 36, 243, 246, 299 f., 311, 320, 322, 338, 487
Thorndike, R. L., 39, 59, 294, 311, 338
Thurstone, L. L., 59, 298, 311, 338, 466 f., 482
Thurstone, T. G., 482
Tiedeman, H. R., 218
Travers, R. M. W., 372
Travis, L. E., 285
Traxler, A. E., 47, 60, 174, 183, 338, 373, 397, 482
Trump, J. L., 125
Tryon, C. M., 294, 311
Tuttle, H. S., 311
Tyler, R. W., 218

Ulmer, G., 246
Unzicker, C. E., 173, 183
Updegraff, R., 423
Upton, C. B., 243, 246

Vallance, T. R., 372

Wallin, J. E. W., 53, 60, 359, 372
Walter, M., 285
Ward, A. H., 246
Ward, W. E., 183
Warters, J., 454, 482
Washburne, C., 71, 88 ff., 98
Washburne, V. Z., 397
Watson, G., 397
Watson, J. B., 18
Weber, C. A., 159
Welborn, E. L., 521, 535
Welch, L., 246
Wertheimer, M., 246
White, C. L., 497 f., 508
Wickman, E. K., 508
Williams, H. D., 434 f., 449
Williams, R. M., 371
Williamson, E. G., 125, 397
Wilson, G. M., 203 f., 218
Wilson, P. P., 97
Wittenborn, J. R., 397
Wood, B. D., 254 f., 285
Wood, E. G., 397
Wood, L., 41, 60
Woodrow, H., 261, 285, 431, 449

- | | |
|--------------------------|------------------------|
| Woods, G. G., 371 | Wright, H. F., 98 |
| Woodward, L. E., 423 | Yale, J. R., 482 |
| Woodward, P., 285 | Yoakum, G. A., 159, 18 |
| Woodworth, R. S., 9, 487 | Youtz, A. C., 218 |
| Worcester, D. A., 8, 22 | Zerfoss, K. P., 22 |
| Word, A. H., 246 | Zimmer, L., 78, 98 |
| Wrenn, C. C., 522, 534 | |

INDEX OF SUBJECT MATTER

- Abilities, primary, 42; special, tests of, 327 f.
- Ability grouping, 49 ff.; methods, 55 ff.
- Achievement, variability, 26 ff.; grade overlapping, 28 f.; tests, 328 ff.; types, 331 f.; and capacity, 34 f.
- Activities, extracurricular, 126 f.
- Admission, to school, 45 f.; to college, 46 f.
- Adults, education of, 23 f.
- Age differences, 35 f., 200 f.; in reasoning, 224 f.; in motor learning, 251 f.
- Aims of education, 61 f., 135 f., 286 f.
- Algebra, 92 f.
- Apperceptive mass, 130, 147, 161
- Arithmetic, 87 ff., 205, 241 f.; commercial, 93
- Artistic training, 103 f.
- Assembly, School, 110
- Assignments, 136 f., 380
- Athletics, 115 ff., 281 f.
- Attitudes, development, 286 ff., 492; nature, 288 f.; methods of teaching, 301 ff.
- Audio-visual education, 142, 160 ff.
- Behavior problems, treatment, 502 ff.
- By-products of learning, 154 f.
- Capacities, special, vs. general intelligence, 320 f.
- Capacity and achievement, 34 f.
- Capacity for learning, 70 f.; interest, and level of aspiration, 458 f.
- Children, exceptional, 424 ff.; of low IQ, 430 ff.; of high IQ, 437 ff.
- Classification of pupils, 49 ff.
- Classroom tests, functions, 340 f.; validity, 344; reliability, 344 f.; types, 347 ff.; essay, 348 f.; objective, 350 ff.
- Clubs, 113 f.
- College admission, 46 f.
- Completion tests, 353 f.
- Concepts, 161, 167 f.; development, 168 f.
- Correlation between traits, 39 f., 41 f., 438 ff.
- Counseling, and guidance, 450 ff.; directive vs. nondirective, 457 f.
- Curriculum, 61 ff.; organization, 62 f.; and attitudes, 299 f.
- Debating, 114 f., 242 f.
- Defects, types, 426 ff.; sensory, 427 f.; motor, 429 f.; low intelligence, 430 ff.; delinquency, 434 f.
- Delinquents, 306 f., 434 f., 491 f.
- Democracy, 102, 110 f., 297 f., 417, 501, 533
- Discipline, school, 153, 483 ff.; factors, 498 ff.; general principles, 505 f.
- Distributed practice, in motor learning, 270
- Distribution of repetitions, 206 f.
- Educational aims, 61 f., 135 f.
- Educational philosophy, 29 f., 132, 358 f.
- Educational psychology, field, 3 f.; difficulties, 16 f.
- Elimination from school, 23 ff., 43 f.

- Emotional, development, 290 f.;
 expression, 101; maturity, 52,
 490 f.
- Empiricism in psychology, 18 f.
- Errors, correction, 150, 207 f.,
 208, 386; in reasoning, 222 f.,
 236
- Evaluation, problem, 370; extra-
 curricular activities, 120 ff.;
 and measurement, 329
- Examinations, and marks, 244;
 final, 342 f., 394 f.
- Experimental education, 19 f.,
 134
- Extracurricular activities, 126 ff.
- Fatigue, 250 f., 390 f., 406
- Foreign languages, 94 f., 176 ff.,
 214 f.
- Forgetting, 73 ff., 148 f., 190;
 motor skills, 264 f.
- Gamma hypothesis, 208
- Gestalt psychology, 144 f., 167
- Gregory Academic Interest In-
 ventory, 475 f.
- Growth curves, 36 ff., 83 ff.
- Growth, mental, 35 f., 70 f., 200
 f., 224 f., 251 ff., 493 f.
- Guidance, 104, 450 ff.; creden-
 tial, 453 f.; methods, 460 ff.;
 personal and social, 462 ff.;
 vocational, 464 ff.; educational,
 475 ff.; for parents, 479 f.
- Guilford - Schneidman - Zimmer-
 man Interest Survey, 471, 472
- Handwriting, 276 f.
- Herbart's five formal steps, 129
 ff.
- Home room, 110, 460 f.
- Honor societies, 115
- Humor and mental hygiene, 414
- Individual differences, 32 ff.,
 95 ff., 106 f., 142 f., 424 ff.; in
 rational memory, 200 f.; in rote
 memory, 209 f.; in achieve-
 ment, 27 ff., 361
- Intelligence, growth and decline,
 323 f.; and achievement, 34 f.,
 322 f.
- Intelligence, nature, 319 f.; level,
 area, and speed, 322 f.; tests,
 319 ff.; types, 326 f.
- Intelligence quotient, 19, 33 f., 39,
 46, 324 f., 455
- Interest inventories, 466 ff.
- Interests, 51 f., 76 ff., 132 f., 139
 f., 189, 287, 486 f.; measure-
 ment, 334 ff.; and reasoning,
 229 f.
- Intra-individual variability, 41 f.
- Jacobson's theory of relaxation,
 404 f.
- Kuder Preference Record, 470
- Languages, foreign, 94 f., 176
 ff., 214 f.
- Left-handedness, 259 f., 277 f.;
 and stammering, 279
- Leisure activities, training for,
 105 f.
- Level of aspiration, capacity, and
 interest, 458 f.
- Marks, class, 244; functions,
 360 f.; unreliability, 361 f.;
 percentage, 363; letter systems,
 363 f.; standard score, 367 f.
- Matching tests, 354 f.
- Maturation and attitudes, 289 ff.
- Measurement and evaluation, 329
 f.
- Memorizing, 184 ff.
- Memory, analysis, 185 f.; ra-
 tional, 187 ff.; rote, 203 ff.
- Mental growth, 35 ff., 70 f., 83
 ff., 200 f., 224 f., 251 f., 289 ff.,
 492, 493 f.
- Mental hygiene, 282 f.; multiple
 factor theory, 400; in educa-

- tion, 398 ff.; heredity and environment and, 400 f.; physical factors and, 401 f.
- Methods of teaching, 126 ff.
- Mnemonic systems, 209
- Moral training, 104 f.
- Morrison unit mastery plan, 128, 129
- Motivation, 76 ff., 107, 139 ff., 204, 381 f., 493 ff.
- Motor, activities, teaching, 247 ff.; capacity and intelligence, 258
- Moving pictures, 179, 298 f.; and attitudes, 298
- Multiple choice tests, 352 f.
- Norms in marking, problem, 362 ff.
- Notes, taking, 391 f.
- Observation, methods of teaching, 160 ff.
- "Outsiders," 306 f.
- Overlearning, 389
- Overresponse, 413 f.
- Overstimulation, 410 f.
- Papers, writing, 392
- Part method, in memorizing, 204 ff.; in motor learning, 268 f.
- Perception, 160 f., 164 f.
- Performance, standards, 317 f.
- Personality, development, 102; tests, 333 ff.; disorders, 436
- Physical exercise, 100
- Prediction, problem of, 454 f.
- Procedures, teaching, 126 ff.
- Prognosis tests, 328
- Progressive Education, 29 f., 131 ff., 148 f., 485, 526
- Publications, student, 114
- Quotidian variability, 261 f.
- Rationalization vs. reasoning, 224
- Reading, 85 f., 170 ff.
- Reasoning, teaching, 219 ff.; nature, 220 f.; deductive, 222; inductive, 220 f., 231 f.
- Recall and recitation, 206; in studying, 287 f.
- Recreation and play, 406 f.
- Relaxation and recreation, 100 f.; and mental hygiene, 282 f., 406 f.
- Retardation and elimination, 24 f., 43 f.
- Review in studying, 389 f.
- School, admission, 45 f.; enrollment, 24 f.
- Self-confidence in reasoning, 233 f.
- Sensory, experience, 142; defects, 163 f., 337, 377, 427 f.
- Sex differences, 40 f., 44; in reasoning, 225 f.; in motor learning, 256 ff.; in amount of education, 23 f.; in emotions, 293 f.; in delinquency, 435
- Social, activities, 115 f.; science, 93 f.; training, 101 f.
- Speed in practice, 270
- Spelling, 86 f., 211 f.
- Spencer's principle of development, 11, 145
- Sports and athletics, 115 ff.
- Stammering and stuttering, 279 ff.
- Stimulation and response, balanced, 407 f.
- Strong Vocational Interest Blank, 466 ff.
- Student government, 110 f., 297 f., 501
- Study guide for students, 376 ff.
- Studying, efficiency in, 149 f., 373 ff.
- Summer camps, 120
- Superior children, 39 f., 437 ff.
- Survey courses, 95

- Tachistoscopic perception**, 162
Teachers, good and bad, 511 ff.; salaries, 523 f.; tenure, 529 f.; and attitudes, 299 f.; and mental hygiene, 415 ff.
Teaching methods, and attitudes, 301 ff.
Teaching, staff, 509 ff.; profession, 509 ff.; difficulties, 522 ff.
Test, validity, 312 ff., 344; reliability, 313 ff., 344 f.; zero, 316 f.
Tests, classroom, 199 f., 339 ff.; types, 347 ff.; and marks, 339 ff.; standardized, 312 ff.; personality, 333 ff.; administration, 355 ff.
Thoroughness, 148 f., 419 f.
Transfer of training, 9, 64 ff., 137 f.; in reasoning, 234 f.; in motor learning, 266 f.; and interest, 487 f.
True-false tests, 350 f.
Tutors, 387, 478
Type studies, 194 f.
Underlining in studying, 385
Underresponse, 412
Understimulation, 408 f.
Unilateral dexterity, 259 f., 277 f.
Verbalization, 180 f.
Vocabulary, in studying, 384 f.
Weighting scores, 369 f.
Whole method, in memorizing, 193; in motor learning, 268 f.

